EXPLORING THE PEDAGOGICAL IMPACT OF INTEGRATING OPEN
EDUCATIONAL RESOURCES IN A COLLEGE COURSE: A DESIGN-BASED
RESEARCH STUDY

by

A Dissertation
Submitted to the
Graduate Faculty
of
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in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Education

Committee:

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Fairfax, VA

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A Dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy at George Mason University

by

Master of Education
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Dedication

To my loving husband, Salim Sultan Al Abri,
for being the first supporter who encourages me to advance my qualifications,
and to my beloved mother for her emotional support.

To my wonderful children, Ishraq, Ahmed, Zoha, and Al Moataz.
I hope this work inspires you to work toward accomplishing your dreams,
just as your dreams inspired me to persevere through the difficult times.

To Dr. Nada Dabbagh, whose support and encouragement have been vital
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My path to completing this doctoral degree passed through many incidents of struggle, but it always ended in success. Important people in my life have helped me to combat the struggle and celebrate the success, and I extend my thanks to each of them.

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Abstract

EXPLORING THE PEDAGOGICAL IMPACT OF INTEGRATING OPEN EDUCATIONAL RESOURCES IN A COLLEGE COURSE: A DESIGN-BASED RESEARCH STUDY

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The purpose of this design-based research study was to design an integrative open educational resources (OER) intervention in a college course, in order to promote open educational practices (OEP). Specifically, this dissertation study aimed to generate design principles that support the integration of OER into a college course in ways that will manifest in OEP, and thereby to inform the design and development of an integrative OER intervention. The research questions that guided this dissertation study investigated two areas: the design principles that support the integration of OER into a college course to manifest in open teaching and learning practices; and how are these OER design principles operationalized and implemented in the course to engage students in the use and creation of OER content. To achieve the goals of the study, a mixed-method case-study approach was used to gather and analyze the qualitative and quantitative data. To develop, design, and evaluate the design principles and OER intervention in an authentic context, three phases of the Integrative Learning Design Framework model were used: Informed Exploration,

Enactment, and Local Impact Evaluation. Each phase used its own particular questions and research methods to carry out the investigation. In addition, the result of each phase provided input to the development of the subsequent phase. The Informed Exploration Phase constructed a pre-dissertation study that entailed rigorous and iterative in-depth exploration of state-of-the-art knowledge and theoretical understanding of OER adoptions and applications, along with conducting rigorous research studies to explore potential problems in OER from different perspectives. The Informed Exploration Phase resulted in defining and determining the problem statement and the initial theoretical conjectures that provided input to the next phases. The Enactment Phase and the Local Impact Evaluation Phase are the actual dissertation study. The Enactment phase included two micro-cycles of iterative development of the design principles and the prototype of the OER intervention. The Enactment Phase resulted in developing the design principles that describe the integration of OER use and creation into a college course; the development of the components of the OER intervention prototype; and designing the OER intervention prototype in EDIT 730. The Local Impact Evaluation phase aimed to evaluate the implementation of the OER design principles and OER intervention prototype in the selected course. The Local Impact Evaluation Phase resulted in refined design principles that can be used by faculty in higher education institutions as heuristic guidelines or best practices for integrating OER beyond providing access to open content. Furthermore, the outcomes of the OER intervention and the new OER design principles that were extrapolated from the findings of this dissertation study were identified. The data showed that integrating OER into this learner-centered course did not contribute to change in the current pedagogy of the course, but it did contribute to change in the main assignments' instructions and guidelines in terms of the way the students

conducted their assignments. The results of this study provide best practices of the potential

of embedding the 5Rs in a course curriculum. The findings suggest that commentary

activities helped students provide comments to the original authors that confirm the

theoretical assumption of students' contribution to continuous improvement of OER content.

One of the more significant findings to emerge from this dissertation study as a result of

integrating the 5Rs into the course instructions of the main assignments is threading across

assignments. Threading across assignments is a constructive process of building knowledge

across assignments within a course and across assignments for an entire academic program.

The findings suggest that the idea of threading across assignments could influence the

pedagogy of courses and support students in practicing the 5Rs and in building on their

assignments and projects across all classes. Moreover, this study found that integrating OER

into a course encourages both instructors and students to reflect on the course curriculum, in

order to improve the instructional materials and learning strategies of the course. The study

resulted in nine refined design principles: (1) To support the use and creation of OER, OER

should be integrated into a course that is designed based on a learner-centered

pedagogical model using the principles of a constructivist approach to teaching and

learning. (2) OER should be embedded as a main component of the pedagogy of the

course. (3) OER integration into a course should support the use and creation of open

content under an open license using effective OER databases. (4) In any course version,

an in-person session should be used early in the course to introduce the OER term, related

attributes, its operationalization, the benefits from engaging in OER use and creation, and

threading across assignments. (5) The main goal of integrating OER into a college course

should be to educate learners about the term OER and related concepts in order to

promote the usage and creation of OER by the learners. (6) Students should have the option to share their assignments under an open license and to select the appropriate license. (7) The instructor should provide a collection of OER content as a starting point for embedding the 5Rs practices in a course curriculum. (8) OER content that is shared openly online should be reusable and end in a meaningful purpose for learning. (9) Creating OER content is more effective through collaborative work between both faculty and students.

Chapter One

Can open educational resources (OER) contribute to continuous improvement in teaching and learning practices? This is a topic of recent discussion in the area of OER, which is a relatively new phenomenon based on the idea that knowledge is freely available on the Internet at less or no cost to students (Murphy, 2013; Wiley & Green, 2012). The beginning of the OER movement was modest. Much of the attention in its early phases focused merely on its usefulness for providing knowledge in its original form to those with limited access to knowledge (Bliss & Smith, 2017). OER has become one of the six emerging technologies and practices that impact post-secondary teaching and learning in the future (EDUCAUSE, 2020). While the use of OER has grown in the education sector over the past 17 years, the goals of the OER movement have not yet been reached. Some researchers (Kortemeyer, 2013; Wiley, Bliss, & McEwen, 2014) highlighted that OER could play a vital role in advancing the quality of education, encouraging the sharing of learning and knowledge, and enhancing educators' capacity to deliver quality instruction.

Despite all these promising possibilities for OER adoption in education, it is still not common in teaching approaches. Kortemeyer (2013) stated that OER has failed to influence everyday teaching practices in most higher education institutions due to some hurdles. These issues are related to discovery (finding proper OER materials), quality

assurance, and remixing OER (Kortemeyer, 2013; Wiley et al., 2014). Furthermore,

Berger (2018) underlined that OER has emerged as a powerful innovation, but its future

in higher education is still uncertain. To date, only a limited number of OER benefits

have been discovered. It is well known that the main purposes of OER in the education

sector are sharing knowledge and equalizing access to it for everyone without hindrances

(Wiley & Green, 2012). Several OER studies (Allen & Seaman, 2014b, 2016; Wiley et

al., 2014) showed cost savings as another evident value of OER adoption in education.

Instructors and students noticed that about 80% of textbook prices decreased due to the

use of open digital textbooks (Bliss, Robinson, Hilton, & Wiley, 2013; Hilton, Robinson,

Wiley, & Ackerman, 2014; Pitt, 2015). Other potential capabilities of OER in teaching

and learning besides the sharing of knowledge and reducing the cost of textbooks have

been continually debated (e.g., Wiley et al., 2014; Pitt, 2015), but not yet empirically

tested. As a result, OER has been widely discussed in recent years by experts (e.g.,

DeRosa & Robinson, 2017; Hilton, 2016) and nonprofit organizations (e.g., William and

Flora Hewlett Foundation, 2013; Open Education Group). DeBarger (2019) stated that

despite the huge investment of the Hewlett Foundation in support of the OER movement,

this movement is far from its goal of improving teaching and learning practices. A

recurring message from the advocates of OER is that "The goals of effective teaching and

learning should drive OER adoption." (DeBarger, 2019, para. 2).

According to the research to date, the perception of the benefits of OER among

faculty in higher education is still limited; this is considered a key obstacle to the

progress of the OER movement (Allen & Seaman, 2014b, 2016; Pitt, 2015). The current

status of OER adoption in higher education is minimal, and acceptance of this new approach is slow (Allen & Seaman, 2016; De Los Arcos, Farrow, Pitt, Weller, & McAndrew, 2016; Hu, Li, Li, & Huang, 2015; Wiley et al., 2014). A study conducted by the Sloan Consortium indicated that the majority of faculty had limited awareness of the term *OER* and lacked understanding of Creative Commons (CC) licenses and the 5Rs (retain, reuse, revise, remix, and redistribute) permissions of OER use (Allen & Seaman, 2014a). However, a positive indication from this study is that the majority of faculty were willing to try using OER and share resources with other educators (Allen & Seaman, 2014b, 2016; De Los Arcos et al., 2016; Wiley et al., 2014). A recent study conducted by Green (2018) as a part of The 29th National Survey for Computing and Information Technology in US Higher Education had these findings for institutions participating in the survey: (a) There has been a gradual, steady improvement over time in institutional support for using OER in courses. (b) In 2018, 64% of these institutions solicit faculty to use OER materials for their courses, which is an increase over 2014. (c) A significant result is that 52% of these institutions prompt faculty to develop OER materials and resources for their courses. (d) The quality of current OER compared to traditional commercial textbooks is still a concern by faculty. (e) A total of 12% of courses use OER content, which is a 5% increase over 2016.

To encourage the adoption of OER across higher education institutions, OER's effectiveness in teaching and learning must be proven. Allen and Seaman (2014b) argued that for faculty to adopt OER into their courses, they need scientific evidence that OER is effective and credible in teaching and learning contexts. In 2013, Wiley proposed an

approach that could make a positive impact in leading the OER movement forward by focusing attention on students' active participation in the construction of knowledge. Wiley's focus was on eliminating disposable assignments that stay within the boundaries of classrooms and make no contributions to the world of knowledge. The proposal to put an end to disposable assignments was drawn from the fact that U.S. college students spend 40 million hours per year doing homework that has no further purpose outside the classroom.

As part of investigating OER's impact on teaching and learning practices, in the summer of 2017, the William and Flora Hewlett Foundation funded the Designing with OER (DOER) Fellows Program. This program is administered by the Association for Educational Communications & Technology (AECT), SIG Open Education, and the Open Education Group. The primary goal of the DOER Fellows Program is to encourage instructional designers, in partnership with subject matter experts, to design and implement effective OER practices in teaching and learning contexts. Specifically, the DOER grant focuses on the development of renewable assignments based on the principles of OER-enabled pedagogy.

The term *OER-enabled pedagogy* was first used by Wiley (2017b) and defined as "the set of teaching and learning practices only possible or practical when [users] have permission to engage in the 5Rs activities" (Wiley, 2017b, para. 7). It is also called *open pedagogy*; throughout this paper, the term *open pedagogy* is used. The renewable assignment is a manifestation of open pedagogy; Wiley (2013) uses this term to refer to students' works that can be publishable and shareable in public under a Creative

Commons CC-BY open license. Wiley (2017c) outlined the principles of open pedagogy as follows: (a) individuals learn by doing things, (b) traditional intellectual copyright limits individuals' learning, (c) open pedagogy removes these limitations and enables individuals to do new things, and (d) consequently, open pedagogy changes the way individuals learn, allowing them to learn in new ways and decide how and what to learn. In the same vein, open pedagogy emphasizes the student-created OER approach, which refers to empowering learners as co-producers in knowledge construction (Ehlers, 2011). Wiley (2017) referred to approaches that enable students to generate OER as OER-enabled constructionist pedagogy.

Adopting open pedagogy and student-created OER approaches emphasize student-centered methods. By replacing traditional textbooks with OER content and adopting this student-centered approach to OER, faculty have an opportunity to create a new way of learning. Instead of viewing knowledge as content students must download and use in their learning, they could view it as content that can be continuously produced, revised, and improved over time (DeRosa & Robinson, 2017). Hence, students can engage in critiquing and improving the body of knowledge in a certain area. This kind of interaction between students and the course content is a process of engagement beyond the boundaries of the course in which students have an opportunity to convert their assignments into OER under certain CC license and publish it online into one of the open digital repositories such as MERLOT and OER Commons. According to Ehlers (2011) and Geser (2012), engaging students in the process of creating knowledge starts the shift

from open content to open educational practices (OEP), which are the activities that support the 5Rs practices in using OER (Conole, 2012).

To date, there are thousands of publications that describe how OER can be created and used; however, a paucity of research studies address how OER can improve educational practices (Wiley, 2013). Clearly, there is a need to examine the potential of OER for improving teaching and learning practices by integrating OEP into OER adoption in courses. Thus, the purpose of this study was to explore the best practices of OER integration as a process toward OEP and examine the effectiveness of these practices in a real-world setting. Specifically, this study aimed to examine OER usage and creation by allowing students to reuse, repurpose, create, publish, and share OER content that supports them to be active and visible participants in the world of knowledge construction through developing a student-centered constructionist approach. The following section provides an overview of the history and development of the OER movement, essential definitions of OER, its associated licenses, and the open nature of OER, followed by an overview of OEP, the possibilities of OER, and significant challenges to the widespread adoption of this movement.

Problem Background

   History and development of open educational resources (Al Abri & Dabbagh, 2018). The concept of open educational resources did not emerge without precedents. The rapid development in technology and widespread availability of the internet led to the emergence of several open practices in education (e.g., open education) (Blackall, 2007; Yang & Kinshuk, 2017) including, online learning, e-learning, and distance

education. The open education movement promotes access to high-quality learning and resources for everybody in the world to share and reuse (Biswas-Diener & Jhangiani, 2017; Organization for Economic Co-Operation and Development, 2007), helps remediate inequality in education by lowering the cost of textbooks (Biswas-Diener & Jhangiani, 2017; West, 2017), and contributes to improving the quality of education for every student by giving instructors the capability to share and build upon their pedagogical innovations. Caswell, Henson, Jensen, and Wiley (2008) traced the roots of the open education movement to the free software movement and described it as a prelude to the emergence of OER.

As previously stated, OER is a manifestation of the open education movement. The term *OER* refers to any educational resources that are freely and openly available for sharing and reusing under certain legal conditions (Caswell et al., 2008). The emergence of this new phenomenon goes back to 1985 when the Free Software Foundation was founded by Richard Stallman to support the free software movement and to grant certain freedom to software users (Caswell et al., 2008). In 1994, the term *learning objects* was introduced by Wayne Hodgins to refer to digital educational resources that could be shared via the World Wide Web (Wiley, 2006). In 1998, the term *open content* was coined by David Wiley and introduced to the educational community, specifically to the creators of learning objects (Wiley, 2006).

Later, in 1999, Open Courseware (OCW) was introduced by the Massachusetts Institute of Technology (MIT) to situate MIT in distance education and e-learning contexts, and to distribute knowledge among educators and scholars worldwide. MIT

wanted to provide these courses as open content for free. However, they faced challenges

concerning intellectual property rights to the embedded materials in the courses.

Consequently, in the following year, Creative Commons (CC) was initiated, which

introduced a flexible set of licenses for open content (Wiley, 2006). As a result, in 2002,

MIT launched the project "MIT OCW" for the public through different initiatives such as

the Multimedia Educational Resource for Learning and Online Teaching (MERLOT)

(Tuomi, 2013). The introduction of OCW was followed by the official launch of OER

when, in 2002, UNESCO arranged a forum meeting aimed at discussing the impact of

OCW on higher education in developing countries (Conole, 2012; Tuomi, 2013). The

meeting established the term *open educational resources*, which was adopted by many

different organizations such as the Commonwealth of Learning (COL) and MIT. A

timeline of the development and deployment of OER is presented in Figure 1.
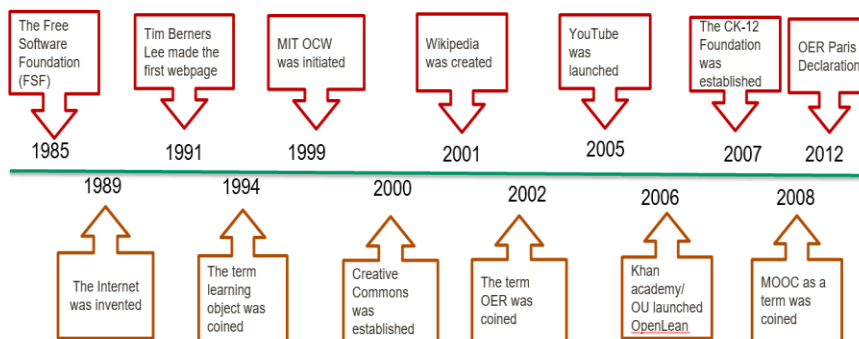
Figure 1. OER timeline

Since the establishment of OER, the movement has spread to many organizations

and foundations such as UNESCO, and the Hewlett Foundation (Conole, 2012). At the

beginning of the OER movement, researchers such as Khanna and Basak (2013) perceived OER as similar to the idea of learning objects due to the reusable nature of these resources. The Hewlett Foundation and UNESCO asserted that the concept and intention behind the OER movement are to provide free education for all, highlighting that "making educational resources freely available to all is a fundamental right" (Conole, 2012, p. 131). As a result, educators and learners have become interested in using OER and created various definitions of OER as described in the following section.

Definitions of OER (Al Abri & Dabbagh, 2018). Open educational resources is a relatively an emergent notion in the education sector. In its early stages, different definitions have been proposed by various institutions, associations, and OER experts reflecting their perspectives about the spirit of OER. Reviewing the literature showed that there is general agreement on the definition of OER developed by the Hewlett Foundation:

> Open Educational Resources (OER) are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (William and Flora Hewlett Foundation, n.d., para. 7).

Furthermore, in the meeting held with the support of the Hewlett Foundation where the term *OER* was coined, UNESCO (2002) defined it as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use

and adaptation by a community of users for non-commercial purposes" (p. 24). However,

Pawlowski and Bick (2012) criticized this definition as insufficient because of their belief

that OER are not available for free (non-commercial) in all cases; rather, this depends on

the type of given permissions. Pawlowski and Bick defined OER as "freely accessible

resources for educational purposes" that include (p. 209) several artifacts and types of

OER as articulated in the following:

- Learning objects and learning resources: Digital content developed for
  education and learning purposes. These kinds of OER incorporate objects like
  multimedia content, simulations, and website resources.

- Articles, textbooks, and digital materials: Materials freely available and called
  open access. They comprise conventional materials and resources offered by
  libraries, such as books, journals, papers, and articles. *Open access* refers to
  all forms of published research, including peer-reviewed and non-peer-
  reviewed academic journal articles, conference papers, theses, book chapters,
  and monographs, that are free of all restrictions on access and free of many
  restrictions on use ("Open Access," n.d.).

- Software tools: Tools employed for varied purposes, including developing and
  customizing learning resources and promoting communication and
  collaboration. These types of resources may be classified as open-source or
  free software such as Linux and Moodle.

- Instructional or didactic designs and experiences: Resources developed by
  instructors and teachers to achieve efficient and successful learning

experiences. Lesson plans and case studies are examples of such teaching

materials.

- Curricula: Methods of sharing experience about teaching and instructional

    materials among educators. This type of approach is called "open education"

    (OE).

- Assets: Objects that cannot stand alone in learning contexts. They are used to

    support a particular topic and enhance the learning context. These resources

    include images, text, and external links, and can usually be obtained through

    search engines.

Finally, a further definition of open educational resources is given by David Wiley (n.d.),

who describes OER as educational content and learning resources that are subject to

Creative Commons licenses or occurring in the public domain for free without having to

obtain copyright and usage permissions, where users can practice the 5Rs

framework/activities. Wiley (n.d.) explained that the 5Rs framework is based on five

permissions: (a) *retain* refers to permission to use and reuse materials with preserving the

intellectual property of the original work, (b) *reuse* refers to permission to reuse the

materials exactly as they are; (c) *revise* refers to permission to adapt, modify, improve,

and change the content, including translating into different languages; (d) *remix* refers to

permission to mix and incorporate the original content with other material to produce

new materials or content; and (e) *redistribute* refers to permission to distribute revised

and mixed original copies among educators or friends (para. 1). All these given

permissions can be used under legal licenses as described in the following section.

Copyright licenses. The traditional copyrighted resources do not meet the education's core value, which is sharing knowledge, due to its restricted copyright permission (Wiley, 2017a). On the contrary, the concept of OER as resources that are accessible freely and openly to all without licensing costs incorporates the authorization and licenses that facilitate and control the 5Rs framework. Creative Commons (CC) permissions and privileges furnished the OER field with a legal framework to protect the holders' intellectual property (Butcher, 2015; Wiley et al., 2014). It retains the author's copyright and privileges, and simultaneously the author must obey the legal frameworks of the CC licenses. Butcher (2015) explained that CC licenses are compatible with multiple copyright laws in different countries; CC supports creating licenses in different languages and also promotes user-generated licenses through the CC website based on users' preferences regarding restrictions on the use of their work (see www.creativecommons.org). Licenses under CC articulate several privileges that can stand alone or be mixed with other CC permissions (Wiley, n.d.; Wiley et al., 2014). These licenses include the following permissions:

- Attribution (BY) aims to give acknowledgment and preserve the right of the original author to the work.
- ShareAlike (SA) aims to keep the same license of the original work in the case of modifying or improving or distributing the original content.
- Noncommercial Permission (NC) aims to protect the author's work from being used for generating profit.

- No Derivatives (ND) aims to restrict users from making any modification to the materials. This is the most restrictive license, which led the OER community to eliminate it from the CC licenses. That is because is not compatible with the essential value of OER on sharing knowledge and allowing users to practice 5Rs activities.

Each Creative Commons license mentioned above allows the creators to protect and preserve their intellectual property while allowing others to reuse, share, revise, and remix it under the given permissions. To explore further the essence of OER in education, it is important to understand the merits of openness associated with the concept of OER as discussed next.

The open nature of OER. OER can be considered as a new technology innovation that individuals will use and adopt. In fact, the term *open educational resources* consists of two parts: *open* (free for use based on the 5Rs permissions) and *educational resources* (a subset of materials such as books, lesson plans, and multimedia that are created for educational purposes). Researchers have not treated the intent of OER in much detail in its early stages. Thus, it is clear that there is a universal agreement on the definition of educational resources but, there exists a persistent misunderstanding around what constitutes free and open resources (Wiley et al., 2014; Butcher, 2015). Butcher (2015) stated that people interpreted the term *open* as meaning that users had full privileges to use the original content. Therefore, open licenses were created to respond to the original authors' concerns and demand to preserve the authorship of their works

under any usage. In addition, the word *open* in an inequality sense refers to promoting

accessibility and providing resources free of charge (Biswas-Diener & Jhangiani, 2017).

Recognizing OER's open nature in the rapidly transforming educational context is

vitally important from a research perspective (Conole, 2012). Wiley et al. (2014)

emphasized that attributes of the open licenses used for OER are a crucial component of

OER's definition. Open license attributions grant users the privilege under intellectual

property law to engage in the 5Rs framework and the Freedom Defined Framework. As

described earlier in this chapter, the 5Rs framework specifies whether activities like

reusing, revising, remixing, redistributing, and retaining materials are permitted. The

Freedom Defined Framework developed by Wenk (2010) (as cited in Wiley et al., 2014)

is described as the freedom to adopt the content and the advantages of OER practices;

freedom to use the content and transfer the knowledge gained to different applications;

freedom to share versions of the content as a complete copy or segments of it; and

freedom to revise, mix, modify, and share derivative versions.

As can be seen from previous explanations, the concept of openness conveys the

intent to promote open practices in education. The concept of openness in the open

education movement, and in particular for OER, incorporates transparency, flexibility,

credibility, and creativity (Biswas-Diener & Jhangiani, 2017). Transparency refers to

developing courses on the open web and reviewing open textbooks by faculty. Flexibility

encompasses adopting open educational resources in different contexts, from hybrid

delivery models, to flexible learning, to developing pathways via an international

network. Credibility refers to the support for OER by professional agencies, through

leading research on the effect of open textbooks on learning consequences. Creativity is related to students' contribution to creating OER, and collaborative efforts to develop accessible resources and enhance OER adoption, in turn, to advance the OER movement.

Furthermore, Huang, Hu, and Liu (2017) provided four key indicators for gauging the openness of OER based on characteristics and connections among users, specifically, the degree to which the material is shareable. These indicators are usability, reachability, scalability, and stickiness. First, *usability*, a term initially used to describe human-computer interaction, refers to the ease-of-use and utility of the potential learning capabilities of OER. It has been used to define sharing OER in terms of the relationship and association between the shapes and forms of OER and access paths. Second, *reachability* relates to the mathematics notion of graph theory. Huang et al. (2017) described reachability as "the relative close[ness] and separate[ness] of a certain scene and its surrounding other scenes to reflect the complexity of this scene to meet the requirements of some activities for people" (p. 155). In sharing OER, reachability refers to the "complexity of educational resources for users" (Huang et al., 2017, p. 155). Specifically, it refers to the formats and shapes of OER and how easy they are for people to use. It explains connections between the shapes of resources and promotion approaches. Third, *scalability* can refer to the wide range of users in public service who have the right to use government services. However, in sharing OER, scalability refers to the adaptation of OER in order to align to specific needs and increase learning access. It explains the connection between application scenarios and promotion approaches. The promotion approaches imply the distribution of OER from developers to end-users, which

can be delivered by users themselves or through traditional marketing and advertising. Fourth, *stickiness* is used in the fields of products and e-commerce to describe the user's experience with a specific product. In sharing OER, stickiness refers to the ability of an OER approach to keep learning services attractive and sustainable for users over time, and works to explain the connections and association between access paths and application scenarios such as creating MOOC for learning.

In summary, openness is an integral part of the term *OER*, as a driver to promote free permission to engage in the 5Rs framework by removing the barriers and frontiers related to copyright licenses. Thus, the concepts of open (e.g., OpenLearn, Khan Academy, Open Courseware, Open University), networked (e.g., encyclopedia, Wikiversity), and personal learning promote and facilitate open practices in education and aid the adoption of OER in teaching and learning (Panke & Seufert, 2013). Having defined what is meant by openness, I will now move on to explain the new trends in the OER movement toward shifting to OEP in the following section, followed by presenting the potential capabilities of OER and significant challenges in this field.

Open educational practices. As explained earlier, the open nature of OER emphasizes moving toward open educational practices in teaching and learning. OEP may play an important role in addressing the lack of evidence for the effectiveness of OER in teaching and learning. OEP is also described as the next phase in the OER movement, in which a shift must occur from a focus on OER as resources to a focus on OEP as supporting openness in teaching and learning practices. The integration of open

resources with open learning architectures can transform learning for 21st-century users (Camilleri & Ehlers, 2011).

Various definitions of open educational practices have been proposed. According to several researchers (Cronin, 2017; DeRosa & Robison, 2017), they are a bridge from the content-centered approach to more open practices, where learners and instructors are sharing the processes of creating the knowledge. According to a definition provided by Cronin (2017), OEP is a broad term that refers to the use, reuse, and creation of OER, open pedagogy, and open sharing of teaching practices. For Conole (2012), OEP means activities and support that contribute to promoting the creation, reusing, revising, remixing, and redistributing of OER. Paskevicius (2017) defines open educational practices (OEP) as follows:

> Teaching and learning practices where openness is enacted within all aspects of instructional practice; including the design of learning outcomes, the selection of teaching resources, and the planning of activities and assessment. OEP engage both faculty and students with the use and creation of OER, draw attention to the potential afforded by open licenses, facilitate open peer-review, and support participatory student-directed projects. (p. 127)

A widely used definition of OEP was provided by Ehlers as part of the OPAL project (Camilleri & Ehlers, 2011), an "Open Educational Quality Initiative" funded partly by the European Commission. Ehlers defined OEP as "practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning

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paths" (Camilleri & Ehlers, 2011, p. 4). Moreover, Ehlers (2011) divided OEP into two related aspects: (a) resources that are available openly licensed for sharing, and (b) pedagogical practices that are employed in contexts of social interaction, knowledge creation, peer learning, and shared learning practices, which are the paths of transformation from resources to practices.

The domain of OEP continues to expand rapidly. Scholars have discussed OEP through different lenses such as open scholarship that promote knowledge exchange through opening scientific reproductions (such as publications and data), and by building trust among educational communities to share, participate, and promote openness to methods and collaboration so, research can be reinforced (Cronin, 2017; DeRosa, & Robison, 2017; Ferguson, 2015); networked participatory scholarship, which is "the emergent practice of scholars' use of participatory technologies and online social networks to share, reflect upon, critique, improve, validate, and further their scholarship" (Veletsianos & Kimmons, 2012, p.768); open teaching that facilitate learning experiences in a form of open, transparent, collaborative, and social contexts by open teachers who help students to develop learning networks for producing and composing information and knowledge (Couros & Hildebrandt, 2010); and open pedagogy as defined above (DeRosa & Robison, 2015; Hegarty, 2015; Wiley, 2014). The multiplicity of OEP definitions and concepts provokes researchers (e.g., Paskevicius, 2017) to suggest the need for strategies or methods that empower faculty to embrace open practices in teaching and learning.

To consider the shift from OER to OEP, there is a need to understand the process toward integrating OEP into OER use. Hogan, Carlson, and Kirk (2015) stated that for

OEP to occur, educators need to engage OER in integration with new pedagogical models such as constructivism and connectivism to advance active and self-directed learning in students in order to develop their skills to live in economic societies. Moreover, Ehlers (2010) outlined a list of important factors that must be present in teachers, students, and organizations in order to shift toward OEP.

Teachers:

- Require skills to learn about how to support user-generated content rather than expert content.

- Must understand how to direct students to acquire self-assessment processes. That means applying the notion of assessment for learning rather than an assessment of learning.

- Must be willing to shift from using only their resources to utilizing the resources of other experts.

Students:

- Need to be independent/autonomous learners.

- Must learn how to assess their own performance and manage their learning.

- Must work collaboratively with peers to learn from each other and provide constructive feedback on their learning.

Organizations:

- Policymakers have to spur the use of OER beyond access to these resources to enhance the quality of education.

Potential capabilities of OER (Al Abri &Dabbagh, 2018). The adoption of open educational resources in teaching and learning must add value to different educational disciplines. Research to date has not yet determined the value that OER will bring to teaching and learning contexts. In fact, the William and Flora Hewlett Foundation (2013) has been committed to supporting OER since the beginning of the movement, and in the last 15 years has tried to introduce the benefits of OER to the education sector. They believe in the philosophy that OER can promote equal access to high-quality education everywhere by making a variety of learning materials, lectures, books, curricula, and online courses available on the Internet for little or no cost. Consequently, the Hewlett Foundation argued that OER has a promising future for improving the efficiency of education at all levels worldwide. They stated that by 2017, OER should be significantly integrated into all educational systems at different levels, including both higher education and K-12, and for-profit and nonprofit organizations. The potential capabilities of OER that are often mentioned in publications can be summarized in five points, according to the Hewlett Foundation (2013): (a) to offer access to knowledge for all, (b) to reduce the cost of education, (c) to deliver greater learning efficiency, (d) to promote continuous improvement of instruction and personalized learning, and (e) to encourage translation and localization of content.

However, empirical evidence to support anticipated values of OER that pertain to enhancing teaching and learning is absent, according to the OER Research Hub (OERRH) (Weller, De Los Arcos, Farrow, Pitt, & McAndrew, 2017). OERRH is a project of Open University in the UK, funded by the Hewlett Foundation, which was

developed to address beliefs about these values and to provide scientific evidence about the impact of OER in education. Regarding this present debate, OERRH argued that the perceived benefits of OER cannot be robust without providing empirical evidence. They established 11 hypotheses that stand as the assumptions and principles of OER (Weller et al., 2017). These hypotheses are:

1. The use of OER leads to improvement in student performance and satisfaction.

2. The open aspect of OER creates different usage and adoption patterns than other online resources.

3. Open education models lead to more equitable access to education and serving a broader base of learners than traditional education.

4. The use of OER is an effective method of improving retention for at-risk students.

5. Use of OER leads to critical reflection by educators, with evidence of improvement in their practice.

6. OER adoption at an institutional level leads to financial benefits for students and/or institutions

7. Informal learners use a variety of indicators when selecting OER.

8. Informal learners adopt a variety of techniques to compensate for the lack of formal support, which can be supported in open courses.

9. Open education acts as a bridge to formal education, and is complementary to, not competitive with, it.

10. Participation in OER pilots and programs leads to policy change at an institutional level.

11. Informal means of assessment are motivators to learning with OER.

To generate scientific evidence based on these hypotheses, 20 surveys were administered by OERRH to 6,000 participants through 15 projects, in collaboration with OER projects across various education sectors (K-12, higher education, and informal learning) to explore the impact of OER on teaching and learning practices and identify the particular influence of openness (De Los Arcos et al., 2014). In this study, 37.6% of educators and 55.7% of formal learners reported that using OER improved student satisfaction, and that cost of and access to materials were critical factors in students' retention. Around 80% of formal students reported that they saved money by using OER, but finding proper OER materials is one of the biggest barriers to using OER. Just under 27.5% of educators and 31.9% of formal learners agreed that OER use improved test scores, and around 79.4% of educators who responded to the survey used OER to merely fit their needs and to gain new ideas in certain content domains. Approximately 95% of educators reported that they shared information about OER (mainly videos); however, just 12.4% of educators reported creating resources and publishing them as OER under Creative Commons licenses. Around 31.5% of informal learners reported that using OER allowed them to try university-level content before signing up for a paid course, and 83.2% indicated that they were more likely to take free courses in the future. The effects of using OER on reflection by educators were varied: 29.8% of educators reported that using OER encouraged them to collaborate more with colleagues, while 78% of community college

respondents agreed on this outcome. Regarding the lack of formal support for OER use, only 18.5% of informal learners indicated that they lacked support for their use of OER due to having a chance to use a variety of techniques such as participating in discussion forums and writing blogs. Regarding policy change at the institutional level, it is likely that it is difficult to find a formal policy referencing OER.

Challenges of OER (Al Abri & Dabbagh, 2018). Several studies (Allen & Seaman, 2016; Davis, 2016; Pitt, 2015) have examined the obstacles to the OER movement's progress in education in general and higher education in particular. First, the discovery issue, or the difficulty of finding high-quality OER that meets users' needs, is a significant challenge to OER adoption. Drabkin (2016) reported that an abundance of OER content is produced by states and districts across the United States, but is located in their own repositories and digital libraries, which are decentralized and do not communicate with each other. The problem of decentralization makes it difficult for faculty to determine and locate the best free resources. Furthermore, the majority of these repositories are not well organized. Thus, searching for proper OER is a time-consuming process for users (Davis, 2016). OER researchers (Drabkin, 2017; Kortemeyer, 2013; Wiley et al., 2014) have proposed some methods to overcome the issue of discoverability. These methods include using the features of social networks such as rating, tagging, and commenting on OER, and using recommender services by asking users to like and recommend the best OER.

Quality assurance is another primary issue in the area of OER adoption. In general, people are still skeptical about the quality of free and open resources on the

Internet. Thus, instructors seek reassurance about whether OER materials have been peer-reviewed, as peer review is one of the most used quality control processes in academia (Biswas-Diener, 2017). Kortemeyer (2013) argued that the issue of quality control in OER is deemed to be significant because OER is used as a one-way path where instructors download OER from a repository, upload it into a content management system, and deploy it without assessing learning success or providing feedback on the original assets for further adaptation or correction. Moreover, if improvements are made, there is no easy way to replace the original version of the content. These deficiencies in improving the quality of OER result in insufficient quality content available online that can be used for free in teaching and learning (Allen & Seaman, 2016). Wiley et al. (2014) pointed out that rating OER, for instance, on some sites can help others in their search for quality OER.

Finally, the ability to revise and remix OER is considered a significant obstacle that hinders OER adoption. The concept of revising and remixing OER is grounded in the idea that people have the freedoms to access and repurpose open educational resources to meet their needs, but earlier efforts in the OER field focused on the dissemination of OER as knowledge rather than revising and remixing it (Amiel, 2013). At the beginning of the OER movement, the open content produced by groups like MIT OCW and the Open Learning Initiative at Carnegie Mellon was openly licensed to use but technologically impossible to alter, since it was produced in PDF format (Bliss & Smith, 2017). As a result, over time, professors who used MIT courses tended to add supplementary resources like videos, simulations, and pictures that could be used in their

original format or customized. Wiley et al. (2014) stated that the empirical evidence regarding users' practices of the 5Rs framework in using OER is limited. Consequently, the power of adaptation and remixing open content became a critical value of the OER movement (Bliss & Smith, 2017). The most likely barriers to remixing include a lack of understanding of the 5Rs activities to reuse and repurpose OER content, as well as the difficulty of repurposing OER with existing traditional pedagogical practices (Kortemeyer, 2013; Wiley et al., 2014).

Statement of the Problem

In the literature regarding OER adoption in education, there is a consensus that we lack explicit evidence for the effectiveness of OER in teaching and learning contexts (DeRosa & Robinson, 2017; Ehlers, 2011; Hegarty, 2015). This evidence scarcity lowers the perception of OER in higher education and limits awareness of the goals of OER and Creative Commons licensing among faculty and students in these institutions. These weaknesses of the OER movement have discouraged the widespread adoption of this novel approach across higher education institutions (Allen & Seaman, 2016; Hilton, 2016; Pitt, 2015). Nowadays, the primary concern about the OER use in teaching and learning is that these open and free resources are used to merely promote open access to knowledge (Ehlers, 2011). The need for evidence of the impact of OER on teaching and learning is eminent as it highlights the necessity of the emerging shift in ways of using OER in education contexts. Researchers (Ehlers, 2011; Geser, 2012) suggest that shifting the focus from considering OER as merely open content to considering it as open educational practices will lead to enhancing the quality of education. Masterman (2015)

underlined that the openness attributes associated with OER can promote innovation in institutional pedagogy when OER is used in courses. Geser (2012) stated that applying OER as part of innovative ways of teaching and learning could change pedagogy and reinforce a user-centered approach to learning. Wiley (2017) asserted that the concept behind adopting open pedagogy with OER integration is not the usage of OER materials per se, but engaging in the 5Rs activities.

A likely explanation for the lack of evidence of OER's impact is that faculty have used OER in a way similar to teaching with traditional textbooks. Hilton (2016) stated that "it is not clear how OER might have been used in each of the [OER initiatives]" (p. 587). DeRosa and Robinson (2017) suggest that open pedagogy uses OER as a bridge from seeing courses as a repository of content to creating an open environment with more collaboration and engagement in the world of knowledge beyond the classroom. Taken together, these findings suggest that OER's transformative possibilities in teaching and learning must be scrutinized utilizing empirical methods. There also seems to be a definite need for formal guidelines for faculty to support the shift from OER to OEP. As a result, it is imperative to explore the design principles that can support these open educational practices in courses at the higher education level, and, in turn, to sustain continuous improvement in the OER movement.

Purpose of the Study

The purpose of this mixed-method design-based research (DBR) study was to design an integrative OER intervention in a college course that will promote OEP. Particularly, this study aimed to generate design principles that support the integration of

open educational resources in a college course in ways that will manifest in open

educational practices, and thereby, to inform the design and development of an

integrative OER intervention. The OER's approaches that examined in this study

included students' usage and creation of OER through the assignments of the course. The

design principles generated in this study are heuristic and stand as formal guidelines for

faculty to integrate OEP in their courses. These principles were based on the assumptions

of theory regarding OER usage and creation- including student-created OER- and

empirical data gathered during the exploratory phase of this study, as discussed

thoroughly in chapter three. Determining the design principles for OEP integration

informed the design of the OER intervention. All these processes were a part of a

systematic cycle of iterative testing, refining the determining theories, and improving the

learning environment toward OER usage and creation. Specific claims were explored in

this mixed-method DBR study: (a) the design principles that support the integration of

open educational practices in college courses, (b) plausible practices for 5Rs activities

that enhance students' contribution to knowledge creation, (c) the effectiveness of these

design principles on creating innovative pedagogy in the course, enhancing students'

view of creating knowledge and engagement in 5Rs activities, and on supporting their

learning, and (d) the perceptions of students and faculty regarding the benefits they can

derive from engaging in open educational practices.

Significance of the Problem

Education is the path to pass skills and knowledge down through generations.

Open educational resources, with the ubiquity of the Internet and innovative technology

nowadays, are a significant tool to distribute and share knowledge worldwide without restrictions. OER can undoubtedly save students money and help them better afford higher education, which would increase access to postsecondary education (Bliss et al., 2013; Pitt, 2015). However, while OER advocates believe that free, open, and flexible resources can improve the quality of education, the absence of empirical evidence regarding the effectiveness of OER in teaching and learning leads to posing questions about the components, and the features of courses-based OEP that can encourage faculty in innovating pedagogy and engaging students in OER usage and creation. This is indicative of the appeal to uncover the other potential benefits of OER besides cost reduction (DeRosa & Robinson, 2017; Hilton, 2016).

The significance of this study was based on three main points. First, to address the absence of evidence for the effectiveness of OER adoption in teaching and learning, an appeal for developing new approaches to teaching with OER has emerged (DeRosa & Robinson, 2017; Ehlers, 2011; Geser, 2012; Wiley, 2017c). It is believed that OER has pedagogical benefits, but OER's improvement of teaching and learning has not been empirically proven. The OER community encourages researchers to explore how the possibilities of OER in innovating pedagogical models can be put into practice in authentic contexts. It is hoped that this study can help fill this gap in research by developing formal guidelines (or set of design principles) for faculty that articulate the process of empowering openness in teaching and learning—specifically, the process of engaging students with a high level of openness in the usage and creation of OER. This development of the design principles informed the intervention of employing students'

engagement in repurposing and creation of OER in a course. The implementation and evaluation of the OER intervention provided evidence regarding the extent to which OER can change teaching and learning practices and enhance contributions to the world of knowledge that reside under open licenses.

Second, this study served as a response to the current discussion over shifting from OER as merely resources to OER as open practices. Advocating for this shift focuses on empowering students to contribute to the public marketplace of ideas and knowledge (DeRosa & Robinson, 2017; Geser, 2012; Wiley, 2017b). Immersing students in a course designed around learner-centered, student-created OER, and engaging in the 5Rs practices encourages them to be active and visible participants in the community of knowledge construction (DeRosa & Robinson, 2017; Geser, 2012; Wiley, 2017b). Consequently, students' contributions to the OER movement can play a vital role in sustaining continuous improvement in this movement (Petrides, Levin, & Watson, 2018). Student-created OER was implemented by encouraging students to convert the actual assignments in the course to OER in the form of renewable assignments that are publishable and reusable by later students without restrictions. Engaging in the 5Rs practices was employed by providing the current students a collections of renewable assignments for previous students for reusing and revising purposes. This kind of contribution implies that students can earn credits for their publications and, simultaneously, their works will go through continuous improvement from users. In this study, evidence were sought regarding best practices for performing 5Rs activities and

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whether the revising and remixing issue around adopting OER can be overcome through renewable assignments.

Third, the vast debate regarding OER adoption in higher education includes concerns about its quality (Gurung, 2017). Indeed, the quality of OER has been extensively examined because it is one of the major barriers to widespread adoption. Thus, there is a need to ensure the quality of OER produced by students in the course before hosting it online as free and open material. The assignments were monitored and reviewed by the instructor and peers in order to make them credible resources. Providing high-quality OER in the form of renewable assignments might help answer the common question of whether OER is "any good" (Gurung, 2017, p. 79). In this study, the quality of the renewable assignments were ensured by developing rubrics and instructor's review before releasing them to the public.

Research Questions

Research Question One: What are the design principles that support the integration of open educational resources (OER) in a college course?

A. What instructional materials and learning strategies will be used to direct students toward OER use and creation?

B. How can the 5Rs be integrated into a college course to support students' usage and creation of OER?

Research Question Two: How are the OER design principles operationalized and implemented in a college course?

A. What are the perceptions of students regarding the benefits and drawbacks of these principles in supporting their learning?

B. What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course?

C. Is there evidence of a shift in the pedagogy of the course?

Definitions of Terms

- Open education: The Cape Town Open Education Declaration (2007) defines open education as follows:

  > Open education is not limited to just open educational resources. It also draws upon open technologies that facilitate collaborative, flexible learning and the open sharing of teaching practices that empower educators to benefit from the best ideas of their colleagues. It may also grow to include new approaches to assessment, accreditation and collaborative learning. (para. 4)

- Open educational resources*:* Open educational resources (OER) are "teaching, learning, and research resources that reside in the public domain or have been released under Creative Commons License for free use, share, and modify by others" (William and Flora Hewlett Foundation, n.d., para. 7).

- Creative Commons licenses*:* Creative Commons licenses make protecting individuals' intellectual property easy and legal, and simultaneously enable others to use, modify, and share open educational resources worldwide legally (Green, 2017).

- Open educational practices: Paskevicius (2017) provides this definition of open educational practices (OEP):

  > Teaching and learning practices where openness is enacted within all aspects of instructional practice; including the design of learning outcomes, the selection of teaching resources, and the planning of activities and assessment. OEP engage both faculty and students with the use and creation of OER, draw attention to the potential afforded by open licences, facilitate open peer-review, and support participatory student-directed projects. (p. 127)

- 5Rs framework: This framework identifies five ways that users may engage with OER. These activities are: *retain* (permission to use and reuse content with protecting authorship of the work), *reuse* (permission to reuse the materials exactly as they are); *revise* (permission to adapt, modify, improve, and change the content, including translating into different languages); *remix* (permission to mix and incorporate the original content with other material to produce new materials or content); and *redistribute* (permission to distribute revised and mixed original copies among educators or friends) (Wiley, n.d.).

- OER pedagogy: This term is defined as "the set of teaching and learning practices only possible or practical when [users] have permission to engage in the 5Rs activities" (Wiley, 2017b, para. 7).

- Disposable assignments: Student work for a certain course that is graded by an instructor and ends up in the class recycling bin at the end of the semester (DeRosa & Robinson, 2017).

- Renewable assignment: An artifact that has personal meaning to students and is shared publicly under the open Creative Commons CC-BY license (Wiley, 2013).

- Student-created OER: Student-created OER is "an approach in which students are not just consumers of content but active and visible participants in the construction of knowledge" (DeRosa & Robison, 2017, p. 115).

- Design principles: Design principles are the essential pillars that support designing interventions either empirically, theoretically, or plausibly to approach the desired goals (Euler, 2017).

- Design-based research: "A systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (Wang & Hannafin, 2005, p. 6).

- Quality assurance: Quality in education is more about the process than a product. The development of open content begins with an overview of an idea as a first version. Through iterative improvement and refinements, and collaboration from the community (or instructors), the quality of individual work will improve over time (WikiEducator, 2009).

Chapter Two

The open educational resources (OER) movement is an emergent movement. It is still in its early stages in education and has not expanded fully into higher education sectors (Allen & Seaman, 2014, 2016). To fully understand the primary purposes of the OER movement, it is important to understand the main events leading to its emergence. I will highlight six events at this point. First, the movement began with *learning objects*, a term coined by Wayne Hodgins in 1994 (Wiley, 2006). The idea behind learning objects was that instructional designers could build small instructional resources to be designed and produced in a way to be reused readily in a set of pedagogical models (Wiley, 2006). If these resources were digital, educators could access them through the Internet to reuse them. The emphasis on reusing digital content drew the interest of the education community. Later, the term *open content* was introduced by David Wiley in 1998 to educators and users of the Internet. The idea of open content in the history of OER is linked to the principles of the open source movement, in that educational resources have to be freely developed and shared "in a spirit similar to that of free and open software," which had been accepted by the education community quickly (Caswell et al., 2008, p. 2).

The introduction of open content was followed by the creation of the first open license, called the Open Publication License (Wiley, 2006). In 2001, the Creative

Commons set of flexible open licenses was released to overcome the pitfalls of the Open

Publication License. CC licensing is used with OER due to its credibility and ease of use,

as well as because it fits with several international legal copyrights (Wiley, 2006).

Simultaneously, MIT announced its OpenCourseWare initiative for free access publicly.

The OpenCourseWare project played a vital role in the OER movement by announcing

the term *OER* in 2002, as explained in Chapter 1 (Wiley, 2006). The proposition of OER

is that these resources will be used by educators and students alike, and that a variety of

educational resources will be available, including OpenCourseWare. The latest trend and

development in the OER movement is the move toward open educational practices (OEP)

in order to improve the use and quality of OER, and in turn, to improve the quality of

education (Ehlers, 2011).

   After understanding the events leading to the OER movement, it is critical to have

an overview of the current status of OER in education. Fundamentally, the adoption of

OER is expected to expand access to traditional higher education as well as distance

education and online learning; OER would be an efficient method to promote lifelong

education (William and Flora Hewlett Foundation, 2013). Wiley and Green (2012)

insisted that the primary purpose of OER is sharing knowledge between a variety of

educators and students. In addition, the William and Flora Hewlett Foundation (2013)

intended, in the early stage of OER adoption, to provide knowledge as a public good.

However, the current status of OER adoption in education is minimal, due to several

obstacles that hinder the spread of OER at the local and national levels (Allen & Seaman,

2014, 2016; Bliss et al., 2013; Davis, 2016; De Los Arcos et al., 2016). Since the OER

movement is still emerging, it is considered a new research discipline that requires further investigation in different areas.

Researchers (Bliss et al., 2013; Hilton et al., 2014; Wiley et al., 2014) have shown that cost saving is the most significant value of OER adoption in education. Most studies (Bliss et al., 2013; Hilton et al., 2014; Pitt, 2015) have focused on the savings derived from substituting OER for traditional textbooks. The question that remains is: What are the possibilities of OER besides cost saving? A few studies have suggested that OER can offer alternative resources for a variety of learners with different learning styles (De Los Arcos et al., 2016; Hu et al., 2015; Pitt, 2015), promote personalized learning to learners to decide what they learn and how they learn (Cohen, Reisman, & Bied Sperling, 2015; De Los Arcos et al., 2016), and contribute to lifelong learning for instructors, self-learners, and people who have limited access to education (Kim et al., 2015; Nikoi & Armellini, 2012). However, this does not appear to change or improve the pedagogical practices as a perceived value of OER (Pitt, 2015). Likewise, using OER does not appear to harm or negatively affect students' learning outcomes, which indicates that OER does not play a motivating factor in learning growth (Hilton, 2016). There is a critical need to investigate the effectiveness of OER in teaching and learning and explore the next stage in the OER movement. In this sense, the essential benefits of the OER movement are that it encourages educators and learners to share and disseminate knowledge among educational communities through practicing the 5Rs activities (retain, reuse, revise, remix, and redistribute) (Ehlers, 2011; Geser, 2012). Hence, this chapter aims to explore and synthesize the theoretical and empirical research about the possibilities of OER for

innovating pedagogy models and promoting students' contribution to the world of knowledge.

Exploring the effectiveness of OER in teaching and learning is essential, since it is a controversial topic in discussions of OER adoption in higher education. First, preliminary research into OER adoption in education provides insights for future research studies necessary in the area of OER adoption, such as identifying the obstacles and enablers that impact OER adoption in specific institutions. Second, understanding the future of OER integration in education from theoretical and empirical perspectives offers a view of the next step toward open education in general and how to move the OER movement forward. Thus, the relationship between openness and pedagogy practices articulates different perspectives about the possibility of OER making a change in existing pedagogy models. In addition, examining lessons learned from learner-generated OER shows how learning occurs with the use of OER and helps determine the factors that motivate learners to create OER content. After these two aspects are explored in the literature review, there is a discussion of how to design an intervention to support embracing OER in further effective ways.

Literature Review Methods

The OER literature reviewed was drawn from credible sources of information. Source data were pulled from the George Mason University Library database (Science Direct, Web of Science, Education Research Complete, JSTOR, ERIC, Educator's Reference Complete, and ProQuest Social Sciences Collections), LearnTechLib, Google Scholar, EDUCAUSE, and nationally and internationally published reports. Most data

were obtained from books, book chapters, journal articles, dissertations, reports, and conference proceedings. The review focused on literature regarding the application and adoption of OER in the K-12 and higher education contexts and exploring whether OER can make a change in existing pedagogy practices as well as students' engagement in the usage and creation of knowledge. Therefore, studies focused on private publishing companies were excluded from this research.

The search keywords used for surveying literature were *open educational resources, concept of OER, K-12, higher education, OER adoption, OER application, OER challenges, implications of OER, open pedagogy, open educational practices,* and *renewable assignments*. The works surveyed were published from 2010 to late 2019, and initially numbered about 163, including 141 articles and studies related to the application of OER, 20 articles of professional experience including blogs, and very few studies related to open pedagogy and student-created OER. After an initial review, studies not fitting the research area were discarded, such as those pertaining to the corporate sector or focused only on economic and financial aspects, as well as the blogs. The final number of articles was 57, including 24 articles and 14 empirical studies focused on demonstrating the implications of OER in higher education and K-12, and 13 articles based on expert testimony, and only 6 studies examining open pedagogy and students' involvement in knowledge construction.

Preliminary Research into OER Adoption in Education (Al Abri & Dabbagh, 2018)

There are limited empirical studies that explore and examine the implications of OER adoption. This literature review included 14 empirical studies; it offers an overview

of the area that has been examined relevant to the adoption aspects and application

approaches, and determines the gaps that need to be addressed in further investigations.

The 14 studies reviewed examined OER projects and initiatives from different

perspectives. Studies available up to this point examined the perceptions and impact of

replacing traditional textbooks with OER, mainly open textbooks, among faculty and

students in higher education institutions and among K-12 teachers, and compared their

perceptions regarding OER after they were exposed to it. Other studies focused on

examining OER's enhancement and adoption from different approaches. These included

the exploration of streamlined processes to help faculty integrate OER in their courses

(Davis, Cochran, Fagerheim, & Thoms, 2016), understanding the barriers that affect the

diffusion of OER, and the types of users' behaviors that occur in learning object

repository (LOR) while practicing OER activities (Cohen, Reisman, & Bied Sperling,

2015; Hu et al., 2015), examining the potential possibilities of OER in cutting cost of

textbooks, and investigating the relationship among factors that affect adult learners'

intention to use OER as well as the role of OER initiatives on increasing learners' access

to higher education sector (Kim et al., 2015; Hilton et al., 2014; Nikoi & Armellini,

2012).

  The existing literature on OER adoption is extensive, particularly focuses on

tracking the perceptions and awareness of OER over time. Some studies (Allen &

Seaman, 2014b, 2016) have been carried out in successive periods to track the awareness

and perceptions of OER among faculty in higher education institutions across the U.S.

after they were exposed to using it. First, Allen and Seaman (2014b) conducted a large-

scale survey based on several previous Babson Research Group reports from 2009, 2010, and 2011, funded by the Hewlett Foundation. The previous studies examined the impact of OER in higher education sectors, including faculty perceptions of OER. This study compared its findings with the previous results to determine if faculty perceptions and awareness of OER had changed since 2009, and to explore the drivers that might force the adoption of OER in higher education. The participants in the study were a representative sample of 2,144 faculty at higher education institutions across the U.S., from all disciplines and different levels of employment, including full-time and part-time faculty at public and private institutions and for-profit and nonprofit organizations.

The findings of the study revealed that a high percentage of faculty were unaware of OER, but were willing to try using it. The faculty who were somewhat aware of OER lacked understanding of the legal permissions and fair use of OER. Regarding the factors that encourage OER adoption, the results showed that faculty awareness of OER was not considered a fundamental factor for OER adoption; the faculty used resources without realizing they were OER content, and they often selected the most cited resources without recognizing the copyright permissions. In addition, the faculty reported that the quality of OER was similar to the quality of traditional materials, but fundamentally, they were unaware of how to evaluate the quality in order to offer their opinions in this area due to "they are not sufficiently aware of OER to judge its quality." (P.49). Allen and Seaman (2014) highlighted that the most significant barrier to OER adoption for the faculty was the time and effort needed to locate and evaluate OER.

In addition to the previous study, Allen and Seaman (2016) conducted a large-scale study as a part of Babson Survey Research Group to examine the impact of the OER trend in higher education and to explore whether the awareness of OER among faculty (in the 2014 report) had changed after they were exposed to using it. This new study aimed to (a) understand the process instructors used in selecting the educational resources for their courses, and (b) examine the degree to which the faculty members were aware of and/ or adopting open textbooks in their courses in terms of realizing the attributes of open copyright licenses, such as who owned the copyright and whether they had privileges to modify, revise, and distribute the content. The researchers surveyed over 3,000 faculty in the higher education sector across the U.S.

The main findings of Allen and Seaman (2016) regarding the process instructors used in selecting the educational resources for their courses showed that the majority of faculty (90%) selected materials either new or revised resources for at least one course over the past two years. Furthermore, the existence of OER alone was not considered a motivating factor that would encourage faculty to make their own decisions to select and adopt OER into their courses. The significant factors that contributed to the faculty's decisions about OER selection were cost, inclusiveness of resources, and ease of finding resources. The results indicated that faculty used openly licensed textbooks as required textbooks for only 5% of courses. That is, the majority of faculty remain lack understanding of creative commons licenses. Regarding the findings related to the awareness of adopting open content revealed that use of OER was low in general in higher education, and the majority of faculty were unaware of the term *OER*; however,

they were interested in using it. Of the faculty in the study, 70% were not OER users; they reported they would consider using OER in the next 3 years. The significant obstacles faculty faced included insufficient available resources relevant to their subjects, the time required for finding appropriate materials, and the lack of an inclusive catalog of resources. It suffices to say that this study revealed that the status of OER adoption among faculty in higher education was unchanged since the previous study in 2014.

On the subject of perceptions of the impact of OER use among students and faculty in higher education, various researchers (Bliss et al., 2013; Jung, Bauer, & Heaps, 2017) have examined the efficacy of open textbooks when they replaced with traditional textbooks from different perspectives. For example, Bliss et al. (2013) conducted a large-scale survey targeting eight community colleges involved in Project Kaleidoscope (PK). PK is an open education initiative established to save a substantial amount of money by reducing the cost students paid for textbooks. The purpose of this study was to understand the impact of replacing traditional textbooks with OER, in particular openly licensed textbooks, on community college teachers and students from COUP (cost, outcome, use, perception of quality of OER) perspectives. The potential participants in the study consisted of 80 teachers and 9,000 students at eight community colleges. Online questionnaires were administered through email to the participants. Overall, 58 teachers and 490 students responded to the questionnaire.

Among the significant findings of the study was that teachers and students collectively reported a significant cost saving due to the availability of open textbooks freely online: 80% reported spending less on textbooks, 72% spent no money, and 6%

spent less than $20. Perceptions of the impact on outcomes were confined to three aspects: teacher preparation time, pedagogical change, and student preparation. In general, teachers reported that adapting existing OER and creating materials to meet their students' needs was a time-consuming process that could hinder teachers from adopting OER in the future. Teachers and students also reported that there was no change in pedagogy practice with the use of OER. The outcome regarding students' preparation is unclear and needs further investigation. Regarding the use pattern for OER, the researchers compared how often students used the required textbooks in typical courses and the open digital textbooks in PK courses. The study showed no change in frequency of using the open digital textbooks over traditional textbooks. Finally, regarding perception of the quality of OER, most students and teachers reported that open digital textbooks were at least equal in quality to the conventional textbooks they had used in previous classes. In conclusion, the researchers suggested further in-depth qualitative studies to explore how OER could improve pedagogical models in teaching, as well as students success rates across and across time (Bliss et al., 2013, p.18).

In the same vein, Jung et al. (2017) replicated and built upon the previous study conducted by Bliss et al. (2013) to examine faculty's perceptions of open textbooks, mainly OpenStax textbooks, in post-secondary contexts. Specifically, the researchers used the COUP framework to examine the cost reduction, outcomes, uses, and perceived quality of OpenStax textbooks. In addition, the researchers extended the area of investigation to examine the relationship between the faculty's perceptions of the quality of OpenStax textbooks and their students' achievement, as well as whether faculty

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intended to reuse OpenStax textbooks in their courses. The study targeted faculty who were using OpenStax textbooks across higher education institutions around the world. The researchers administered an online survey to 150 participants.

The results of the study by Jung et al. (2017) suggested a new direction in OER adoption pertaining to the use of open textbooks in improving pedagogy practices. This result was evident through employing student-centered instruction such as flipped classrooms, active learning strategies, and collaborative learning, in terms of using a variety of hands-on activities and exposing students to the authentic learning experience. This finding was made based on the assumption that while everyone has a textbook from the first day of the class, faculty can support students to have a strong sense of ownership of their learning. Furthermore, the freedom of customizing open textbooks was considered an important factor that influenced faculty to prepare supplementary materials for their courses, which was deemed a significant challenge to OER adoption. Since the popularity of OER is growing around the globe, the researchers advocated for deeper understanding of innovating instructional approaches related to the use and adoption of OER in courses.

Furthermore, Nikoi and Armellini (2012) examined an "OER mix framework: Purpose, process, product, and policy (Ps)" at two institutions, the University of Leicester (UOL) and University College Falmouth. The development of this framework was a manifestation of the Open, Transferable, and Technology-Enabled Educational Resources (OTTER) Project at the UOL, which promotes the concept of open content and its value in maximizing learners' access to higher education as a response to social inclusion

programs conducted by the British government. The four Ps of this framework were defined as follows: *purpose* referred to the intention to adopt OER in institutions; *process* referred to the development of quality OER; *product* referred to the level of the OER in terms of quality, fitness, relevant content, and ease of use; and *policy* referred to the strategy for OER inclusion at the primary institutions. The researchers conducted face-to-face interviews of staff and senior managers across departments, and emailed an open-ended online survey to students. Overall, 19 staff and senior managers participated in 20- to 60-minute interviews, and 71 students responded to the survey.

The major findings of the study by Nikoi and Armellini (2012) were that participants generally endorsed the concept of openly sharing educational resources and that OER has immense potential to help different users, students, staff, self-learners, and people who have limited access to higher education. The perceptions of OER among participants were varied: they referred to information and learning and teaching resources. The OER mix framework that the researchers developed to promote the concept of open content provided easy, understandable, organized, and feasible methods for all institutional stakeholders to improve their initiatives with respect to the OER concept. The researchers uncovered questions for future research such as "What do institutions do to maximize access opportunity to open resources, and what they should do to increase social inclusion by using OER?" (Nikoi & Armellini, 2012, p. 181). The researchers encouraged their colleagues to examine the OER mix framework at more higher education institutions for further improvement and refinement.

In the area of K-12 education, researchers (De Los Arcos et al., 2016; Kelly, 2014) attempted to examine perceptions of OER among schoolteachers. First, De Los Arcos et al. (2016) conducted a global survey to examine K-12 teachers' perceptions of the use of OER in different contexts, including face-to-face, blended learning, and online learning. This study built upon a report produced by the Boston Consulting Group in 2013, which indicated that educators in U.S. schools used a wide range of OER due to the low cost and the flexibility of adaptation. This study was carried out as a part of the OER Research Hub, funded by the Hewlett Foundation to examine the impact of OER in teaching and learning through testing 11 hypotheses (listed earlier in this paper) related to the potential capabilities of OER (see http://oerhub.net). The participants in this study were 657 K-12 schoolteachers worldwide, who were mainly involved in different OER projects and initiatives such as OpenLearn, the Flipped Learning Network, the Saylor Foundation, Siyavula, and P2PU/School of Open.

De Los Arcos et al. (2016) found that most teachers adapted OER to suit the needs of their classrooms. The researchers associated this result with a strong relationship between OER and personalized learning, in which teachers offered a variety of resources for students and promoted the opportunity to personalize what they learned and how they learned it. Interestingly, the study showed that most K-12 teachers were unaware of the Creative Commons license and the extent to which they could use OER with certain CC permissions. Furthermore, the OER repositories they used most often were YouTube, TED talks, Khan Academy, and iTunes, and the types of OER they used most often were videos, open textbooks, images, and quizzes. In addition, the study showed that teachers

in online and blended learning classes used OER more than teachers in face-to-face classes. The major challenge teachers found was the discoverability issue, in terms of finding high-quality OER materials that were relevant to their subject area. At the end, the researchers asserted that raising awareness among K-12 teachers about the open licenses was essential, but changing teachers' practices in searching for OER and sharing activities would be more important in the future.

Another study in this area is the work of Kelly (2014), who examined the perceptions of OER among K-12 teachers and expanded the study to include educators in higher education and professional development. Kelly argued that understanding how educators in different educational sectors perceived the usefulness of OER would help OER creators develop materials that meet the needs of particular groups of students and inform teachers about the best practices for embedding OER into lesson plans and curricula. Kelly used the Social Learning Theory to understand how educators adopted OER through exploring the concepts of self-efficacy and outcome judgment in perceptions of OER. In addition, the Technology Acceptance Model was used to examine the effect of self-efficacy on perceptions of the usability and usefulness of OER in terms of perceived ease of use, perceived usefulness, and actual system use. A web-based survey was administered to 224 educators, of whom 128 completed responses.

The results of Kelly's (2014) study suggest that individuals who are confident in using online communications software are not necessarily confident in using OER. Furthermore, the study found a relationship between individuals' perceptions of OER and its ease of use and usefulness in general. Well-designed OER content can contribute to

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improving attitudes about OER adoption. Also, there was a strong relationship between ease of use, usefulness of OER, and intention to use OER in any context. OER creators need to consider the audience and usability of their resources. While there are many positive drivers to move OER adoption forward (such as cutting the cost of textbooks), there are challenges to the spread of OER, such as limited funding for creating and maintaining OER content and the low quality of existing OER.

Furthermore, Zhang and Li, (2017) attempted to evaluate the impact of online teaching experience on faculty members' perceptions about attributes of OER in Zhejiang University in China during the 2014-2015 academic years. Zhang and Li (2017) sought to explain how adopters of online teaching perceived the attributes of OER. The researchers believed that OER is one of the biggest innovation occurred in modern education systems that related to online education practices. Thus, the adopters of online teaching can play a vital role in adopting OER. Zhang and Li adopted Rogers's (2003) innovation theory as the theoretical foundation for this study to explain how educators perceived and experienced OER based on five attributes: relative advantages, compatibility, complexity, trialability, and observability. The target participants were faculty members at Zhejiang University. The researchers administered questionnaires randomly; 380 faculty members were invited to participate in the survey and 360 responses were analyzed.

As the primary purpose of OER is sharing knowledge with everybody, it is expected to bring about changes in education worldwide. Zhang and Li (2017) found that 90% of educators were willing to share their personal educational resources on the university website, and 60% were willing to share their resources on external sites. The

inclination to share knowledge within an internal context was stronger than the inclination to share externally. In addition, 41.51% of faculty had shared materials without restriction, while 56.6% of faculty had shared resources with restriction. Regarding the attributes of OER, the results corresponded with some previous studies (e.g., Acker, Vermeulen, Kreijns, Lutgerink, & van Buuren, 2014) that demonstrated a relationship between intentions of sharing knowledge and individuals' self-efficacy and trust as perceived attributes of the innovation, OER. The result of the study concluded that, most faculty endorsed relative advantages and compatibility as attributes of OER on sharing their educational resources online under open license. However, there were contradictory attitudes toward other attributes related to complexity, trialability, and observability, probably due to the faculty's lack of experience in online teaching and awareness of OER.

Moreover, Davis et al. (2016) examined an OER initiative at Utah State University (USU) to explore a simplified process for determining the courses that were most suited for OER use and how faculty perceived OER adoption. The main reason for this project was to combat the high prices of textbooks if faculty replaced traditional textbook with OER. Librarians at USU approached OER integration into courses by working closely with instructors who taught online courses and blended courses for Fall 2014. They used the course objectives and learning outcomes as criteria for selecting and evaluating OER relevant to the courses. Seven of the 49 faculty members agreed to participate in the project. After searching for relevant and suitable OER for courses, the library team developed questionnaires to survey faculty about whether the resources they

selected were relevant and suitable for their courses' syllabi, whether the OER improved their courses, and how they could improve the process. Only five faculty members completed the questionnaires.

In drawing their conclusions from this study, Davis et al. (2016) emphasized that establishing a collaboration with faculty to create a streamlined process for OER adoption in university courses is important, and their findings could be used by librarians in other universities as a toolkit for their OER adoption projects. Most faculty in this study reported that they integrated the selected OER into their courses, and they found that open textbooks were the most useful resources: that is, faculty could use alternative open textbooks as supplementary materials and promote flexibility in editing and determining certain sections to use. Despite these positive results, the librarian team encountered the obstacle of time spent selecting and adopting the relevant OER into courses; they stated that it was a "time-intensive task" (Davis et al., 2016, p. 30). Consequently, the librarian team decided to archive their lists of OER for future use in order to overcome the issue of time and workload. In the end, the researchers emphasized that the library team must continue their investigation and expand their roles widely in the area of OER adoption across the campus to reach faculty as well as students.

On the subject of the impact of adopting open textbooks in higher education institutions, Pitt (2015) conducted a joint research study with OpenStax College (OSC) and OER Research Hub (OERRH) to examine the effect of OER on educators through the use of OSC open textbooks. Three hypotheses, developed by OERRH, were tested: the use of OER improves students' accomplishment and satisfaction levels; the open

nature of OER engenders a variety of usage and adoption modalities compared to other

online resources; and OER adoption creates financial benefits for students at the

institutional level. A mixed research method approach was used for data collection. First,

the researcher administered two sets of educator and student surveys in Fall 2013 and

Fall/Winter 2014/2015 to over 7,000 participants from over 180 countries. After

participants completed the survey, interviews were conducted with selected individuals

who showed an interest in further participation and contribution to this study. As a result,

three participants were interviewed after the 2013 survey, and five participants were

interviewed after the 2014/2015 survey.

The results of this study showed that OER materials, mainly the OSC open

textbook, helped faculty provide resources that met students' needs, and teaching

practices became easier. Most faculty preferred to use trusted sources of OSC that

recommended by others to shortcut the process of searching for materials. Pedagogical

changes were reported by a few faculty, but the researcher stated that this needed further

investigation. The study showed that OER significantly helped students save money and

led to an increase in students' participation and satisfaction. The researcher proposed a

need for in-depth systematic investigations to explore how educators use OER, the

motivating factors that encouraged them to use OER, and whether OER produced

changes in their pedagogical approach. Additionally, Pitt (2015) stated that there was a

demand to test additional hypotheses, such as that the use of OER leads to critical

reflection by educators with evidence of improvement in their practice and time spent in

adopting OSC materials as well. Further exploration could include designing a

longitudinal study for a wide range of participants to expand the findings of this study. Finally, the researcher suggested improving the questionnaire structure for future research.

In the area of potential benefits of OER in lowering the cost of education, Hilton, Robinson, Wiley, and Ackerman (2014) conducted a study to examine the cost savings on textbooks by adopting OER across seven community colleges in United States. The context for this study was the Kaleidoscope Open Course Initiative (KOCI)—an open education project. The main purpose of this study was to measure the amount of money saved by students in KOCI courses when OER replaced the traditional textbooks and compare it to the amount of money spent by students in non-KOCI courses. The participants of this study were seven schools involved in the KOCI project, which was implemented from 2010 to 2011. The amounts students spent on textbooks were gathered in Spring 2013 from bookstores on the campuses of targeted colleges and the school bookstore websites; Amazon was also used to estimate the average cost. The researchers identified the list of books each teacher recommended for Spring 2013 courses.

This study only examined the effectiveness of OER from a financial perspective. The results showed that the claim that OER reduces costs for students is valid. The cost of textbooks for non-KOCI courses was higher than the cost for KOCI courses by about $1 million for one academic year, and the results showed significant savings for students who enrolled in KOCI courses. For non-KOCI courses, the average cost of textbooks was $90.61, which indicated that a total of $900 was spent annually per student. A broad

adoption of OER would make the cost approach zero. This suggests that OER can benefit

not only students, but parents and taxpayers who fund students' enrollment in college.

Taking another approach, Kim et al. (2015) examined factors relevant to adult

learners that might impact their intentional use of OER. Specifically, the study aimed to

contribute to the development of OER content for the lifelong education field that would

promote the diffusion of OER among adult learners. The study was conducted with

students at Korea National Open University. The variables used in this study were

components of the Technology Acceptance Model (TAM), which explains individuals'

behavior in adopting new technology. The determining factors were variables related to

the intentional use of e-learning that have also been used in the context of OER:

perceived ease of use, perceived usefulness, attitude, subjective norm, self-efficacy, and

job fit. An online survey was distributed to students through email and administered

during the period between August 27, 2012, and September 16, 2012. A total of 1,158

students responded to the survey.

Kim et al. (2015) found that the factors with a positive impact on students'

intention to use OER were perceived ease of use and job fit. This result is compatible

with previous studies, in which perceived ease of use was found to have an impact on the

intent to use OER in education. Job fit was a positive factor because the responses came

from adult learners with jobs: that is, OER is good for individuals who combine work

with education. Another interesting result was that perceived usefulness was found to

affect the intent to use e-learning, but had no effect on learners' intention to use OER.

That is, perceived usefulness, in this study, stands for learning utility in which all

participants can access sufficient content through e-learning related to the university. The researchers concluded that there was a need for follow-up studies to identify factors in the social environment and individual characteristics that would have a positive effect on the intention to use OER in educational fields.

On the subject of the minimal adoption of OER in higher education, Cohen et al. (2015) examined individuals' behavior while using a learning object repository as a facilitator for the adoption of OER. The individuals' experiences were examined by analyzing their behaviors while practicing OER activities. The data were gathered from two sources: the Bookmark Collection of the Multimedia Educational Resources for Learning and Online Teaching (MERLOT) repository and different activities related to communities. The Bookmark Collection of the MERLOT repository classifies users into categories based on their activities. Different community activities were used to understand the educational value of such collections, including peer reviews, providing recommendations, adding learning activities, and submitting additional materials for developing new content. Data collected included the usage rate for the personal space (the Bookmark Collection), the most used OER materials, the types of user activities, and the extent to which users capitalized on the potential and value of OER.

Cohen et al. (2015) found that individuals had the opportunity to construct and present knowledge in a unique way that fit their personal style of use, and learning process creators had the opportunity to use content created by others and store it in their private repositories in order to adapt and customize it later to meet learner requirements. These practices led to a more personalized learning process; improved the quality of the

materials, since they were connected to excellent materials across several disciplines; and

enhanced individuals' satisfaction with the content they used. Another significant finding

of the study was that reusing OER in personal spaces created a vibrant community

through user activities such as writing comments, rating, recommending, sharing learning

activities, and peer reviews, which increased user trust in the quality of the content of

collections (such as MERLOT). Finally, the researchers advocated exploring extra

sharing approaches in personal spaces and showing best practices to further promote

OER use.

On the subject of barriers and challenges, Hu et al. (2015) conducted a study to

understand the use of OER and explore the barriers affecting the diffusion of OER among

college students in Chinese higher education. The researchers examined the association

between personal characteristics of college students and their recognition of the hurdles

affecting the use of OER. The context of the study was Zhejiang University (ZJU), one of

the top universities in China. The sample for the study was selected randomly from the

seven departments at ZJU during the academic year 2012/2013: 1,200 students were

randomly selected to complete the printed version of the survey, and other students were

invited to participate in the online survey on the university website. A total of 1,239

students (92.75%) responded to the printed and online surveys.

Hu et al. (2015) found that the critical factor affecting students' attitudes toward

OER was ease of use, in terms of providing attractive OER content that was user friendly

through an easy website interface. Diffusion of OER also had a critical impact on OER

adoption among students in higher education. Thus, institutions must carefully consider

the required skills and capacities and strive to facilitate a collaborative learning environment for successful diffusion of OER. Furthermore, the study indicated that OER had been used as supplementary resources and were not deemed vital components in Chinese formal higher education. In the end, the researchers concluded that to effectively utilize OER to improve the quality of education in higher education sectors, universities must develop and execute a special orientation program for OER that targets students. Finally, the researchers recommended future studies based on collecting learner analytics data through students' online courses.

Overall, while studies indicate that the most significant benefit of OER is cost savings (Allen & Seaman, 2014b, 2015; Bliss et al., 2013) as well as promoting personalized learning (Cohen et al., 2015; De Los Acros et al., 2016), there is still uncertainty about the possibilities of OER related to improving pedagogy practices and delivering greater learning efficiency (Jung et al., 2017; Pitt, 2015). There is a need for more empirical studies to prove the effectiveness of OER in learning and teaching (Weller et al., 2017; The William and Flora Hewlett Foundation, 2013). The following sections review the literature on whether OER can bring about radical change in existing pedagogy practices or coexist with current teaching practices, as well as how it can be used to engage learners in the usage and creation of knowledge.

A Review of Theoretical and Empirical Literature on Open Educational Practices

According to Cronin and MacLaren (2018), between 1970 and 1981, open education was defined to encompass flexibility of distance and place, student selection of activity, the affluence of learning resources, incorporation of curriculum domains,

shifting toward individual or small-group instruction rather than large-group teaching, and making teachers facilitators of learning and supporters of self-regulated learners. In the course of the open education movement, several phenomena have manifested, from learning objects in the 1990s to MOOCs in 2010 to advance learning in this digital age. In 2007, the concept of open educational practices (OEP) was introduced to push the movement further forward. OEP is multidimensional, and has a broad view, ranging from seeking the use-reuse and creation of OER to more openness in educational practices such as open teaching and open scholarship (Cronin & MacLaren, 2018). A recent discussion around the Hewlett's OER strategy in 2019 engendered a concern by educators and OER practitioners that is "the access [to OER content] alone is not enough. Equitable and effective use of OER requires an investment in people as well as content." (DeBarger, 2019) Para 3). To do so, the shift to integrating OER into teaching and learning practices entails developing "evidence-based approaches" to extrapolate the news ways of how OER are situated in the pedagogy practices of a certain course and gleaned in better outcomes for learners (Para. 3). Research to investigate the impact of OER in improving teaching and learning practices and explore embedding OER in OEP has been limited thus far. However, the following sections explore how the theoretical and empirical literature elaborate on the concept of OEP as a manifestation of open education in general and OER in particular, discuss the key assumptions that emerged from this literature review, and suggest ways that research can put theory into practice by shifting from open resources to open teaching and learning practices in higher education contexts.

The relationship between openness and pedagogy practices. One of the most significant current discussions around the adoption of OER is related to the possibility of OER making a change in pedagogy practices and models. Some proponents of OER have claimed that pedagogy practices must change in order to achieve the full capabilities of this movement. Other experts point out that the features of openness reinforce teachers' ability to review their current educational practices and adopt openness to suit specific needs (Masterman, 2015). Some scholars (Koseoglu & Bozkurt, 2018) argued that the need for understanding the open process as a process activates learners' engagement with OER. Discussion of the relationship between openness and pedagogy practices from different points of view can advance our understanding about how OER will change pedagogy practices. There are only three empirical studies presented, which was conducted by Hilton, Wiley, Chaffee, Darrow, Guilmett, Harper, and Hilton (2019), Masterman (2015), and Paskevicius and Irvine (2019)

There is a vague relationship between openness and pedagogy practices in institutions that have adopted OER, as discussed above (Geser, 2012; Masterman, 2015). A small-scale study of undergraduate courses by Masterman (2015) at the University of Oxford examined the association of openness with radical transformation in existing pedagogy practices, asking "whether openness really does entail a radical change in an institution's pedagogic approach, or whether it can co-exist with the current approach" (p. 339). Oxford has a research-informed teaching approach (research-led, research-oriented, research-based, and research-tutored) that aims to equip students with essential competency for learning and living in the digital age. The researcher interviewed 14

academics who were involved in OEP (e.g., contributing to OER collections or being

active in open science) and had received awards for excellence in their teaching. The

findings of this study suggest that OER could be employed at Oxford without affecting

the stability of its current pedagogical models. They also suggest that openness can

promote innovation in institutional pedagogy if the existing pedagogy is not solid (for

instance, if it is based on objectivism). The researcher called for further investigation of

"the extent to which OER really do constitute either a necessary or a sufficient catalyst

for radical pedagogic change" (Masterman, 2015, p. 345).

In a recent study, Hilton, Wiley, Chaffee, Darrow, Guilmett, Harper, and Hilton

(2019) examined students' perceptions of the value of open pedagogy (open teaching and

learning practices) compared to traditional teaching approaches at the University System

of New Hampshire. This study was conducted during the 2017-2018 school year through

the Academic Technology Institute affiliated with the university. Nineteen instructors

participated in the study to use OER in their classes. The use of OER in classes was

designed based on the principles of open pedagogy and was varied among the classes. In

the first group of classes, instructors asked students to revise an open textbook or to

create quiz banks to support existing OER. In a second group of classes, instructors

engaged students in course redesign by creating the syllabus, learning outcomes,

assignments, and rubrics; the guidance for each class was determined by the instructor. In

a third group of classes, instructors were limited to directing students to participate in the

class's online activities such as posting responses or assignments on blogs or social media

networks. At the end of the semester, 173 students were administered a survey regarding

their experiences with the open pedagogy used in the classes. The results of the study showed that 53% of the students felt that open pedagogy had great value compared to traditional learning and teaching practices. The students who were in favor of open pedagogy reported "increased knowledge, relevance, and personalization" (Hilton et al., 2019, p. 282). The researchers highlighted that 47% of the students preferred to learn in classes that used traditional pedagogical approaches to teaching and learning; those few students perceived that traditional pedagogy had greater educational value than open pedagogy. The researchers felt that this perception was due to the students' insufficient capabilities in learning with emerging technologies, and in some cases, students did not want to donate their work under an open license. Further research was proposed to examine the efficacy of open pedagogy and its impact on educational practices as well as faculty members' experiences with using the principles of open pedagogy in courses.

Similarly, by drawing on open educational practices (OEP) in the use of OER, Paskevicius and Irvine (2019) examined the impact of OEP in reforming teaching and learning practices with post-secondary educators in British Columbia, Canada. In fact, there are a remarkable number of OER adoptions and uses in this context: The BC Campus open-textbooks initiative has 2000 open textbooks being adopted by a significant number of faculty (N=435), and there are several open-access journals such as the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council of Canada. Thus, the resources and technology tools were in place. Since there was not a consensus definition for OEP at this stage, the study by Paskevicius and Irvine (2019) used a qualitative phenomenological approach to explore the educators'

experiences in engaging with OEP. The researchers purposively selected the participants' faculty who had truly changed their pedagogy practices as a result of engaging with this novel approach to the use of OER, and who had the capability to reflect on their experiences of engaging with OEP. Eleven educators were interviewed synchronously.

The findings of this study indicated that all practitioners defined OEP in different ways in relation to their teaching approaches. The results suggest that integrating the aspects of OEP by integrating the use and creation of OER in classes and using the availability and affordances of open resources and technology tools such as LMS and WordPress catalyzed practitioners to constitute new learning designs drawing on constructivist and networked pedagogy. The results showed that OEP was embedded in the design of learning in different ways, and that OEP tended to encourage learners to use the opportunities provided to engage openly and directly in open teaching and learning practices. Examples of these open educational practices were engaging learners in developing a collections of open course resources, and involving learners in contributing to open scholarship by publishing their own research or projects. Distinctively, three aspects of openness emerged as a result of this study: (a) exploring open resources as a means of making learners aware of OER and associated concepts such as open license, OER repositories, and techniques for locating proper OER materials; (b) openness by design in a form of engaging with the tools, resources, and activities for creating open content artifacts that can be legitimately shared openly in public; and (c) open online publishing as a means of publishing artifacts openly online, posting reflection in open learning environments such as blogs and WordPress, and engaging in peer-review

activities in OER repositories under the umbrella of the 5Rs practices. In this study, educators reported that the open approaches they used in teaching and learning practices promoted active learning experiences through enabling learners to share their work in real time and make it valuable beyond the course; this allowed for formative feedback and peer review, built digital literacies appropriate for the open world of knowledge, and promoted the learners' engagement among different learning communities (Paskevicius & Irvine, 2019). Moreover, it was suggested that it is important to help learners develop an understanding of the OER concept, and it is important to address the concerns learners may have regarding their participation in open learning environments. Additional research is needed providing detailed case studies of OER and how faculty develop and engage in OER learning designs.

Analysis of pedagogical levels of OER adoption was first carried out by Ehlers (2011) when he examined the findings of the Open Educational Quality Initiative (OPAL) report *Beyond OER: Shifting Focus from Resources to Practices.* OPAL is an international network to promote innovation and better quality in education and training through the use of OER. Based on the inferences of this report, Ehlers introduced a matrix of pedagogical levels based on the degree of openness and freedom (Figure 2), and a matrix of diffusion of OEP in certain contexts (Figure 3). The matrix of pedagogical levels of openness encompasses (a) a low level of openness, in which the objectives and methods of learning and teaching are one way of transformation; instructors determine how and what learners need to learn; (b) a medium level of openness, in which objectives are predefined, but the methods of teaching and learning

are slightly flexible in a way that promotes knowledge construction based on a number of techniques such as problem-based learning and dialogue-oriented methods; and (c) a high level of openness, in which learners determine objectives and learning paths, learners become self-regulated, and teachers act as supporters and facilitators for the learning process. The matrix of OEP diffusion is conceptualized in two dimensions: the freedom of individuals to practice OEP in their learning, and the degree of involvement of others in sharing practices and collaboration. This matrix encompasses three levels of freedom or openness: (a) at the low level of openness, there is lack of encouragement of OEP in teaching and learning contexts, (b) at the medium level of openness, there is some use of OEP in teaching and learning contexts, but no meaningful sharing or collaboration, and (c) at the high level of openness, OEP is integrated in actual learning and teaching activities as part of meaningful sharing and collaboration. Furthermore, Ehlers (2011) asserted that OER initiatives needed to center on different aspects, such as innovating educational practices to raise the quality of OER, and that the utilization of OER required a "culture of sharing, valuing innovative and social-network-based forms of learning, and encouraging novel pedagogical models" (p. 7).

		OER Usage		
		Low No OER (re-) us-age	**Medium** OER (re-)usage or creation	**High** OER (re-)usage and creation
Learning Architecture	**High** Social practices, Collabora-tion, Sharing (Reflection in action), • „open" objectives • „open" methods	A	B	C
	Medium Dialog, Procedures, Rules (Know-how) • „closed" objectives • „open" methods	D	E	F
	Low Knowledge transmission (Know that) • „closed" objectives • „closed" methods	G	H	I

Figure 2. Matrix of pedagogical levels based on the degree of openness (Ehlers, 2011).

		Degree of involvement of others into the OEP		
		Low Low degree of sharing/ collaboration	**Medium** Medium degree of sharing/collaboration	**High** High degree of sharing/collaboration
Individual Freedom to practice open education	**High** Advanced degree of OEP embedded into learning/teaching	A	B	C
	Medium Some islands of OEP	D	E	F
	Low Little or no OEP	G	H	I

Figure 3. Matrix of OEP diffusion (Ehlers, 2011).

In their thorough review of OEP to explore trends and patterns in this emerging area, Koseoglu and Bozkurt (2018) identified the social factors that play a vital role in supporting engagement with OER and open teaching and learning approaches. These factors included sharing to accrue benefits for others and spur joint collaboration with peers, promoting authentic learning in teams, and providing a space for flexibility and

collaborative learning. It is clear that the current OER movement is on the border of shifting from accessing resources, to open education practices, to more openness of teaching and learning methods. Consequently, it leads to a high level of open pedagogy if OER is deployed in innovative learning scenarios and practices (Ehlers, 2011).

To better understand the mechanisms of open pedagogy in OER and its effects in teaching and learning, Hegarty (2015) asked, "How can an open pedagogy benefit learners and teachers alike, and precipitate creative and inclusive communities in an OEP [open educational practices] sphere?" (p. 5). Consequently, Hegarty developed a model of open pedagogy (Figure 4) that is grounded in five principles of openness, first proposed by Conole (2013): (a) sharing knowledge, (b) collaboration and communication in teaching and learning, (c) jointly enhancing knowledge and resources, (d) critique for scholarship improvement, and (e) promoting innovation.
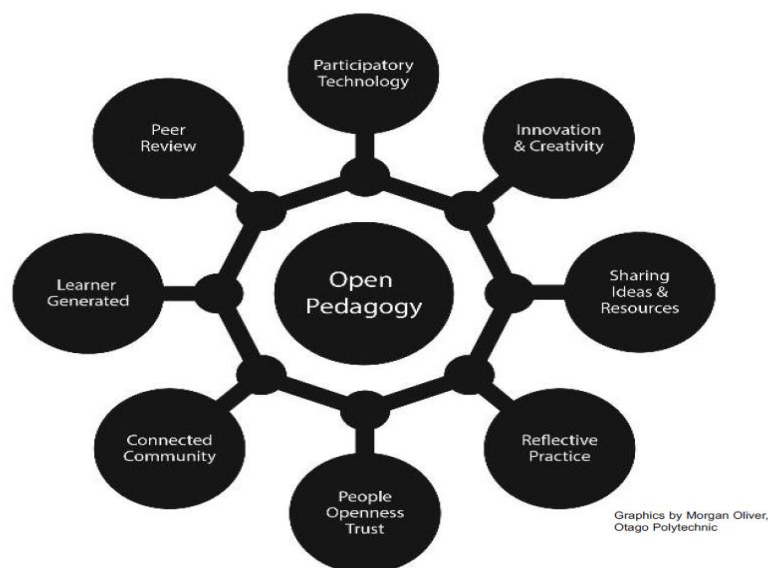
Figure 4. Eight attributes of open pedagogy (Hegarty, 2015).

The eight components of open pedagogy are intertwined and interrelated in different ways, as illustrated below:

- Participatory technologies: Social networks and media are considered as connected tools to promote the creation and shareability of OER. In the open education approach, the emphasis is not only on the type of license associated with the content; rather, it is more related to the essence behind the permissions of sharing and the technology used to bolster this approach and, in turn, to encourage interaction in teaching and learning.

- People, openness, trust: In order to encourage learners' engagement in an open environment, they need a vibrant community where they can readily access and share resources, interact with others, and feel comfortable, trusted, and valued. Consequently, learners will build self-confidence and independence in the open learning environment, and gradually they will become the creators and producers of the content.

- Innovation and creativity: Participatory technologies (social media) empower both learners and instructors to be creative and innovative in learning and teaching strategies. These kinds of strategies encourage learning-driven innovation in open learning domains where learners and instructors can work together in creating knowledge. This creativity and innovation necessitate using technology efficiently, changing the role of instructors, and making learners' engagement in education meaningful.

- Sharing ideas and resources: Building an open learning environment requires sharing ideas, resources, personal knowledge, and skills as well as teaching methods/techniques. As a result, the sharing trait supports the dissemination, diversity, and quality of knowledge. As mentioned above, innovation in teaching strategies directs the movement toward user-generated content, and this would be approached by adopting open pedagogy that necessitates communication with peers and connected and trusted learning communities.

- Connected community: The connected community provides an environment for educators to collaborate and share ideas. This kind of inclusion creates a participatory culture where professionals connect to each other and collaborate in a meaningful way and, in turn, contribute to knowledge on the Internet.

- Learner-generated: How can OER move to the OEP sphere? The magical point to consider in this aspect is that the philosophy of openness opens the process of teaching and learning to empower learners' involvement in creating learning experience through building content (artifacts), solving problems, and negotiating their ideas in a meaningful way.

- Reflective practice: Building a collaborative learning environment or learning communities among teachers and their peers, as well as among teachers and students, can engender reflective practices that improve or change the design of pedagogical practices in an open learning environment. This kind of critical

reflection most occurs with openly licensed content where educators can use, revise, and share their expertise for improvement purposes.

- Peer review: Participatory technologies foster open practices in creating, sharing, and critiquing ideas and resources. For example, peer review is an essential practice in the participatory culture. It plays a critical role in advancing the accuracy and quality of OER through different open learning environments.

In the same vein, Biswas-Diener and Jhangiani (2017) stated that the open education movement improves the quality of education for every student through empowering instructors with the capability to share and build upon one another's pedagogical innovations. In addition, the open movement expands possibilities for customization and shareability among educators, which leads to creating further engaging, interactive, and practical teaching materials. Moreover, Wiley pointed out that the concept behind open pedagogy is not the usage of OER materials per se; rather, engaging in the 5Rs activities is the main point. Thus, OER should be used as a modifier for types of pedagogy, such as "OER-enabled constructionist pedagogy." (Wiley, 2017, para.7). I addition, Wiley (2017) noted that the way we use tools and resources is more important than the tools and resources themselves. Likewise, Hogan et al. (2015) suggested a need for non-traditional pedagogical models such as constructivism and connectivism that move toward OEP to improve innovation in teaching and learning. Hegarty (2015) attempted to rationalize the term *open pedagogy* based on the attribute of openness, which enables instructors and learners to collaborate, share work, and interact through distributed learning

environments readily. In the same vein, by examining the Open e-Learning Content

Observatory Services (OLCOS) project that was established to foster the creation,

distribution, and repurposing of OER in Europe and beyond, Geser (2012) demonstrated

that OER would be effective in making a change in pedagogy if it was used in innovative

ways in teaching and learning.

As far as the lack of evidence regarding the effectiveness of OER in teaching and

learning is concerned, recent developments in the OER movement have heightened the

need for a framework that can assure the sustainable progress of this movement over

time, across various contexts. Petrides et al. (2018) developed the CARE (Contribute,

Attribute, Release, Empower) Framework for OER Stewardship to deal with the issue of

empowering an individual, institution, or organization to be a good "steward" and a

contributor to the evolution and sustainability of the OER movement. However, this

framework is not operationalized yet. The CARE Framework locates people (users,

creators) at the center of the development of OER through four practices (as shown in

Figure 5):

- Contribute: *Contribute* refers to specific activities and types of support OER
  stewards need to commit to. The OER stewards are active contributors to the
  OER movement, whether financially or otherwise; raise awareness of the
  values and affordances of this phenomenon; help improve OER adoption in
  terms of development, customization, and maintenance; and support the
  dissemination and distribution of OER to students who encounter difficulties
  with access, formats, and low bandwidth. This active role of OER stewards

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asserts the role of individuals to take as well as to give and to be visible

participants in knowledge construction.

- Attribute: *Attribute* refers to the willingness to give credit for authorship and

  sharing expertise with others. Attribution can be for original work such as

  instructional materials and multimedia objects, or for revising and improving

  previously published works. "OER stewards practice conspicuous attribution"

  by giving credit to the users who create, remix, or revise OER in a clear and

  appropriate way (Petrides et al., 2018, para. 11). The developers of the CARE

  Framework believe that this approach promotes improving the quality,

  relevance, and usefulness of materials through the collaborative, continuous

  contribution of the OER community.

- Release: *Release* refers to the ease of use and flexible technology tools and

  platforms that facilitate OER adoption. OER stewards guarantee that open

  content will be publishable and usable beyond the boundaries of classrooms,

  courses, and platforms by providing technology tools in which students and

  educators have the ability to download and share content beyond certain

  platforms.

- Empower: *Empower* refers to leveraging the participation of new and non-

  traditional voices in the creation and remixing of OER (Petrides et al., 2018,

  para. 19). OER stewards endeavor to include the diversified needs of all

  learners, including novice users, by expanding participation and encouraging

collaboration, remixing, sharing content and expertise with others, and

embracing this novel phenomenon.
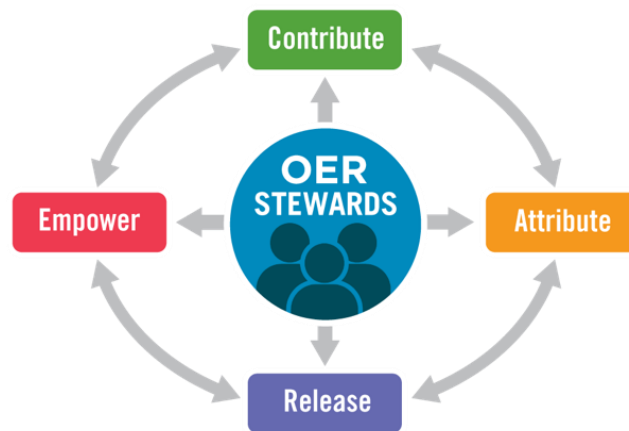
Figure 5. The CARE Framework for OER stewardship (Petrides et al., 2018).

In the end, it is clear that there is a consensus among the researchers (Geser, 2012;

Hegarty, 2015; Masterman, 2015; Wiley, 2017) regarding moving toward embedding

OER in OEP. Collectively, they asserted that as long as current pedagogy practices are at

a high level of openness (learner-centered method), OER adoption can lead to meaningful

change in further opening the educational practices. The following section explains how

delivering unique pedagogical models can contribute to involving learners in creating

knowledge.

Lessons learned from learner-generated OER's best practices. The OER

movement is apparently on the verge of a shift from open content (e.g., MERLOT, MIT

OCW, OpenLearn of OUUK, Rice University, and OER WIKI UNESCO) to open

practices in teaching and learning (Hegarty, 2017). According to Geser (2012), primary attention must be given to open educational practices that immerse students in active and productive engagement with content/knowledge, tools, and services that are required for supporting the learning process and promoting needed skills such as self-management, creativity and group work; cMOOC is one example of OEP. That is, cMOOCS use OER and other materials in a connectivist pedagogical model, where learners have opportunities for both consuming and constructing knowledge (Hogan et al., 2015). Thus, more recent attention has focused on the student-created OER approach. However, compared to the increasing amount of research on OER adoption applications, there are very few empirical studies of the student-created OER approach because it is an emergent trend in the OER movement. The following section discusses this approach from different theoretical perspectives and reports findings about the associated learning process. There are only three studies presented: one was conducted recently and examined engaging medical students in improving health-related articles (Allen et al., 2017), and the other two studies discussed the results of reports on transformation from OER to OEP (Ehlers, 2011; Geser, 2012).

To develop a clear understanding of the student-created OER approach, researchers (Masterman, 2015; Siemens, 2004) linked its essence to different beliefs and explanations. According to Siemens (2004), connectivists believe in the possibilities of tectonic transformation of learning in societies, due to the abundance of knowledge on the Internet and the rapid development of technology, which has made the world connected and interrelated, and learning no longer an internal and individualized process.

From another perspective, Masterman (2015) described how learners' capacity to discover information resources independently as a promising driver toward access to knowledge is situated with constructivism, where the role of instructors shifts from being the primary source of knowledge to being learning advisors and facilitators in the learning process. In addition, it is important to define and justify the term *knowledge creation* to link its meaning to the adoption of OER. Knowledge creation is a product of individuals' cognitive processes such as association and reflection, and knowledge can be created, shared, and improved through collaborative and social processes among individuals, groups, or communities (Nonaka & Takeuchi, 1995).

The main issue concerning OER experts is the effectiveness and usefulness of OER in engaging students in the usage and creation of knowledge. Ehlers (2011) discussed a report from OPAL, which examined the shift from OER to OEP, and highlighted that the early focus on the OER creation process paved the way for the next stage, which is OEP. Ehlers also argued that the adoption of OER in a conventional learning environment using instructive and exam-based methods should not be considered OEP. Fundamentally, the major benefit of using OER and open practices in education exists if (a) the learner-generated content approach is the dominant method of teaching and learning; (b) instructors take the role of facilitating and scaffolding; and (c) the learning process becomes much more productive and leads to more productive learning outcomes. Those productive results are represented in the form of artifacts that are openly available for sharing and repurposing. Similarly, Hogan et al. (2015) indicated that adopting OER in instructivist/behaviorist educational models where the learning

environment is teacher-centric is not considered OEP. Geser (2012) shared the result of a large-scale survey in Europe and beyond regarding teachers and students' experiences using OER in order to comprehend the relevance of OER and determine the needed actions to address the challenges in OER. The report showed that OER could reinforce a user-centered approach in learning and accordingly, in lifelong education; learners in the world of OER became the producers of educational content and were motivated to share their works with others.

In another attempt to explore learners' engagement in knowledge construction with the use of OER, DeRosa and Robison (2017) underlined lessons learned from shifting emphasis from the adoption of OER to espousing OEP and highlighted the key challenges that occurred in the implementation process. The lessons learned centered around the content design approach; when the OER content became the central focus of a course and was designed to thoroughly promote engagement in learning, the course could shift to a learner-centered approach. That is, OER adoption can contribute to advancing openness in pedagogy practices by moving from courses as a repository of content to courses as incubators and platforms for learning, collaboration, and engagement beyond the boundaries of classrooms. According to DeRosa and Robison, this shift occurred with the change in interaction, where the content promoted student-student interaction and student-instructor interaction through several constructivist activities such as students' assignments and online forum discussion.

Moreover, DeRosa and Robison (2017) presented several examples that demonstrated the potential of open pedagogy (OER-enabled pedagogy) for promoting

students' active participation in knowledge construction instead of knowledge consuming. These examples were: (a) Wikipedia on Latin American Literature (assigning students to edit and improve the accuracy of Wikipedia articles), and (b) an open textbook on Early American Literature (assigning students to revise and remix OER resources to build the open textbook and develop course materials, including multimedia forms of OER such as videos and images). The students' work was published and offered freely and openly online. These artifacts were rough content, but writing is an ongoing process of reviewing, comments, and suggestions to improve its quality. Consequently, students needed to engage in the digital world to improve their assignments and projects. DeRosa and Robison emphasized the need "to change the web from a stale collection of rapidly-outdating artifacts of perfection to a living, growing collaborative space where new ideas are always developing" (p. 122). Finally, DeRosa and Robison concluded that the power of *open* empowers students' capabilities in knowledge construction and gives them appreciation for their active contributions to the public arena of knowledge. This kind of transformation can occur when we use OER as opening textbooks rather than an open textbook, and when we consider OER as something *to do with* instead of *to find* or *to use* to utilize its possibilities in learning.

In a more recent study by Allen et al. (2017), the researchers examined a joint pilot initiative by WikiProject Medicine and the University of California, San Francisco (UCSF) that aimed to have medical students improve Wikipedia's health-related articles. The researchers offered fourth-year medical students extra credit for their engagement in editing Wikipedia articles in the period between November 2013 and November 2015.

The course was designed, delivered, and evaluated by faculty, medical librarians, and personnel from WikiProject Medicine, Wikipedia Education Foundation, and Translators Without Borders. This initiative aimed to examine the impact of students' edits on the content of Wikipedia, the effect of this kind of course activity on student participation, and the effect on "readership of students' chosen articles" (Allen et al., 2017, p. 194). The students had not been trained or advised to improve the content of articles in Wikipedia. The results revealed that 43 enrolled students made a total of 1,528 edits, improving 493,994 content bytes, an average of 11,488 per student. The editing process encompassed supplementing higher-quality content and eliminating lower-quality content; students added 274 new references. Students' perceptions of the process could be summarized as follows: (a) it caused an uncertainty between comprehensiveness and legibility, but the readability of most articles increased over time, and (b) students enjoyed improving articles in Wikipedia and were willing to widen their participation in their physician responsibilities in the global network. During the editing process, the Wikipedia statistics showed that the 43 articles were viewed 1,116,065 times; after completion of the process of editing, these articles have been viewed around 22 million times.

Recently, there has been renewed interest in making students' assignments matter. Wiley (2016) characterizes the assessment that have no further purposes beyond the classrooms as "disposable assignments" (para.1). Wiley described the typical process of performing assignments as follows: Instructor assigns student to write a two-page compare-and-contrast essay and submit it for grading, then returns it to the student. The

student checks the grade, briefly scans for any comments, and throws the assignment away. In response to this, Wiley (2016) proposed a new way to make the hours spent on assignments more useful: he introduced "renewable assignments" that can "add value to the world in some way" (para. 2). Wiley (2016) highlighted that renewable assignments are the best examples of open pedagogy at this point. The philosophy of renewable assignments is based on providing permission for others to revise, remix, and build on them; without these permissions, the students' works cannot be considered renewable.

Overall, since the establishment of the OER movement, its emphasis has shifted several times: from introducing the concept of OER, to the production process, to the use and sharing models, to integrating into educational systems, and now toward using the characteristics of openness to change traditional educational practices and involve students in producing free and open content.

Chapter Summary

The review of this literature suggests that OER adoption in education is minimal and a time-consuming process. The awareness of OER among faculty in higher education and K-12 is still limited, and this is a key obstacle confronting OER adoption. One positive indication is that the majority of faculty are willing to try using OER and share resources with other educators. However, the majority of faculty also lack understanding of Creative Commons licenses and the 5Rs permissions to use OER.

In addition, this literature review examined the largest debate around whether OER can contribute to continuous improvement in teaching and learning. One of the more significant findings was that as long as an institution's pedagogy practices were

teacher-centered, adopting OER had a minimal impact on innovating teaching and learning practices. As yet, the potential of OER to transform these practices has not been realized. There is a need for innovative forms of support for the reuse and creation of OER and an empirical evidence base about the effectiveness of OER in teaching and learning. To take advantage of the potential benefits of OER in teaching and learning, there is a need to establish a culture of sharing and trust and continue developing novel pedagogical models.

It is apparent that the OER movement is shifting from accessing open content to embracing OEP and more openness in teaching and learning. This is an indication to shift toward a learner-centered approach; learners in the world of OER are the producers of knowledge and are willing to share works with others. There is a consensus that if OER is used in a course designed according to behaviorist models, it is not considered open practice: that is, the learners in behaviorism are passive participants. The novel approach of open pedagogy exists when OER is used in a course designed with a learner-generated content approach and the teacher taking the role of facilitator; learning outcomes become much more productive and can be shared as OER for use outside the boundaries of learning contexts. Consequently, adopting OER must occur in a constructivist learning environment or/and employ active learning strategies where content is learner-generated and the learning context is a platform of interaction, collaboration, exploration, and engagement in knowledge construction. Finally, it is critical to consider OER as something *to do with* instead of *to find* to utilize its potential in learning.

The present paper lays the groundwork for future research into improving the usage and creation of OER beyond accessibility to knowledge. So far, studies on OER have treated it like traditional textbooks—as resources or open content. Thus, there is a lack of evidence regarding the impact of OER in teaching and learning. The endeavors existed at this point of using OER in a form of OEP are modest. Faculty require a form of support that guides them in the transformative change in the use of OER as well as an evidence that convince them to embrace OER beyond accessibility to more openness in their teaching and learning practices. We know that engaging students in OEP leads to engaging them in knowledge repurposing and creation, but there are no formal guidelines for integrating these open practices with the use of OER in college courses. To do so, there is a need to define and articulate design principles that support the integration of OER in a form of OEP in college courses. As a result, this dissertation study proposes using design-based research (DBR) to develop design principles for college courses that best support embedding OER into OEP, and to design an integrative intervention for engaging students in OER repurposing, creation and publication. The next chapter outlines the research method and design of this proposed study.

Chapter Three

   This chapter describes the research method that guides the phases of this

dissertation study. First, a thorough overview of the intention behind conducting

educational design research alongside an overview of the design-based research, the

Integrative Learning Design Framework (ILDF), and the development of design

principles for a learning environment design was described (Bannan, 2007). Second, the

pre-dissertation phase was expounded as a meso-cycle that was undertaken through four

exploratory micro-cycles. These micro-cycles of the informed exploration phase

encompassed (a) two micro-cycles of extensive literature review (initial literature review

at the beginning of the phase and focused literature review at the end of the phase), (b) a

qualitative case study, and (c) and a mixed-method study, which are presented in details

in this chapter. Specifically, these micro-cycles of exploration and analysis embodied the

investigation of the current status of OER adoption in education and exploring the gaps in

the literature that need further investigation to manifest OER use in OEP. In addition, the

factors involved in the adoption and non-adoption of OER were analyzed, and insights

about faculty and students' perceptions of renewable assignments were unfolded. As a

result of this analysis and exploration phase, the initial theoretical conjectures were

produced. Third, in the second half of this chapter, a thorough description of the

enactment phase was presented. Finally, in the last part of this chapter, a description of

the local impact evaluation phase was discussed. The enactment phase and local impact

evaluation phase represented the actual dissertation study. Each of these two phases

involved distinct research questions, participants, settings, particular data collection, and analysis methods. The results of these two phases were discussed in chapter four. Figure 6 illustrated the scheme and timing of the DBR including the pre-dissertation phase and the actual dissertation phases.

Phase	Micro-cycles	Purpose	Questions	Methods	Participants
Informed Exploration Spring 2017-Spring 2018	Micro-cycle1: Initial literature review	Gained an overview of OER Defined the gap in OER research			
	Micro-cycle 2: Qualitative case study	Determining the factors of adoption and non-adoption of OER	1.What are faculty perceptions of OER adoption in higher education institutions? 2.What are the factors affecting the adoption and non-adoption of OER among faculty in higher education? 3.Do faculty in higher education willing to reuse OER in their courses and why?	Semi-structure interview	OER leaders
	Micro-cycle 3: Mixed method: pilot study	Examined the concept of renewable assignments	1.To what extent are graduate students in EDIT 730 aware of the core concepts of OER? 2.How do the students and their instructor perceive the concept of integrating renewable assignments into EDIT 730?	Survey Semi-structure interview	Graduate students & the instructor
	Micro-cycle 4: Focused literature review	Gained an in-depth understanding of open pedagogy and OEP. Produced initial conjectures			
Enactment Spring 2019	Micro-cycle 1 : Spring 2019	Generated design principles and created the components of OER intervention	Q. What are the design principles that support the integration of open educational resources (OER) in a college course? 1.What instructional materials and learning strategies will be used to direct students toward OER creation? 2. How can the 5Rs be integrated in a college course to support students' reuse and creation of OER?	Focus group One-to-one interview Expert reviews	• The instructor of • Two experts from Stearns Center for Teaching and Learning at GMU • A member from Mason publishing group • A librarian education •A graduate students from previous classes • OER experts
	Micro-cycle 2: Spring 2020	Designed OER intervention		Designer reflection Artifacts analysis (1)	• The researcher • The instructor
Evaluation: Local impact Fall 2019-Spring 2020	Micro-cycle 1: Fall 2019	Implemented and evaluated OER intervention	How are the OER design principles operationalized and implemented in a college course? 1. What are the perceptions of students regarding the benefits and drawbacks of these principles in supporting their learning? 2. What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course? 3. Is there evidence of a shift in pedagogy of the course?	Pre-post survey Focus group Semi-structure interview Artifact analysis (2)	• The researcher
Integrated Learning Design Framework					

Figure 6. The scheme and timing of this DBR based on ILDF (Spring 2017–Spring 2020).

Educational Design Research

This study aims to contribute to this growing area of research by exploring the potential possibilities of OER in innovating pedagogical models and improving learning efficiency. Thus, the purpose of this educational design research study is to generate design principles that support the integration of OER through a form of open practices in a college course, and thereby to inform the design and development of an integrative OER intervention. As a result, there is a need for innovative forms of support for the use and creation of OER that are compatible with pedagogical practices.

Different terms are used interchangeably to describe educational design research, such as *design research, development research, design experiments,* and *design-based research* (Wang & Hannafin, 2005). Throughout this dissertation, the term *design-based research* will be used. DBR was selected as a research method to carry out this study for the following reasons. First, the effectiveness of OER in teaching and learning practices has not been realized yet; it is an open, complex problem, and it is still under debate whether OER can make a change or coexist with current educational practices. According to Kelly (2010), DBR is recommended for "open, or more appropriately, wicked problems" (p. 77). Thus, it is essential to use rigorous research methods that contribute to solving this complex problem in a real-world context.

Second, there is a claim that the evidence base is lacking regarding OER's potential benefits. Guidelines or design principles that can support designing a course focused on OER use and creation are unavailable. Kelly (2010) asserted that design research is suggested when a problem that pertains to learning and teaching is persistent

and a guideline to address the existing gap is absent. It is known at this point that OER are used in learning environments as resources only, similar to textbooks (Hilton, 2016). Bannan-Ritland (2003) described DBR as constructive research; thus, it is used in this study to develop design principles that can stand as formal guidelines for faculty on how to effectively integrate OER use and creation into their courses through innovating practices in teaching and learning. Fundamentally, one of the main outcomes of DBR is to generate design principles based on theoretical assumptions into phenomena (Pool & Laubscher, 2016). In this study, these theoretical assumptions were derived during the informed exploration phase (illustrated in Table 3) and were used to produce significant design principles that support the integration of OER into the course's curriculum including revising, remixing, creating and distributing OER.

Third, shifting from OER to OEP is the next stage in the OER movement, as discovered recently by the experts Ehlers (2011) and Geser (2012), but there have been few attempts to understand how the next phase in this movement will be achieved (Hegarty, 2015; Master, 2015). Theory refinement and design principles combine the theoretical and empirical forms of knowledge production, and are a basis for designing practical activities to achieve determined practice goals (Euler, 2017). Thus, deducing the design assumptions from the theoretical and empirical reviews in this study informed the design of the OER intervention. Several researchers (Jacobsen, 2014; Reeves, 2006) characterized DBR as interventionist research to create innovative and effective solutions to solve complex learning issues in real-world settings. Jacobsen (2014) asserted that DBR contributes to addressing theory-practice gaps, and making OER an integral part of

the course curriculum in this study helped testing the effectiveness of these initial design principles or "proto-theory" in shifting from merely open content to OEP focused on the reuse and creation of OER (Euler, 2017, p. 3).

Finally, there is a need for approaches to study this novel phenomenon in an authentic context with practitioners. In this study, producing the design principles and designing the intervention involved a substantial collaborative and consultation process between the researchers and practitioners (subject matter experts and other experts in teaching and OER adoption) in real-world contexts. An iterative process of refinement was conducted until the desired outcome is reached, which is an essential principle of DBR (Jacobsen, 2014). Students' reuse and creation of OER was the focus of the intervention. Students and instructor's experiences provided significant insights that resultant from this DBR study.

Specific claims were explored in this mixed-method DBR study: (a) design principles that support the integration of OER in a college course, (b) plausible practices for 5Rs activities that enhance students' contribution to repurposing existing OER for previous classes and knowledge creation of OER, (c) the effectiveness of these design principles and OER intervention on developing innovative pedagogy and enhancing students' learning, and (d) the perceptions of the instructor regarding the benefits of OER intervention in the course design. The overarching research questions that guided the design of this study are:

- Research question one: What are the design principles that support the integration of open educational resources (OER) in a college course?

- Research question two: How are the OER design principles operationalized and implemented in a college course?

Design-Based Research

Learning technologies have been viewed by educators, policymakers, and school leaders as promising tools for enhancing teaching and learning performance. However, conducting research to examine the improvement of educational practices and learning progress through the use of learning technologies has been criticized as inconsequential (Amiel & Reeves, 2008; Wang & Hannafin, 2005). Amiel and Reeves (2008) pointed out that traditional experimental design research has not offered solutions for the complex challenges and issues that occur in education, due to its isolation from everyday educational practices (Van den Akker, Bannan-Ritland, Kelly, Nieveen, & Plomp, 2007). Consequently, there is a need for a new direction of research that can address these complex problems. A research approach that deals with real-world practices is critical in educational contexts. Several researchers (Amiel & Reeves, 2008; Jacobsen, 2014; Van den Akker et al., 2007) have asserted that DBR can be a more effective and efficient approach that offers an optimal solution for complex problems, particularly in learning technologies.

Jacobsen (2014) endorsed educators' claims about addressing the theory-practice gaps in educational resources by extracting new knowledge directly from the complex practices and existing issues in authentic settings. This claim emphasized that a new educational research approach must be pursued to create and improve sustained innovations in education. Likewise, Amiel and Reeves (2008) asserted that traditional

predictive research in the field of learning technologies does not portray the actual educational practices in classrooms and is therefore deemed a less systematic approach. As a result, there is a crucial emphasis on changing current practices of educational researchers in all areas to use a more systematic approach, one associated with collaborative methods of examination and exploration, in order to make an impact in actual use. This change is achieved by considering two aspects of learning technologies: (a) recognizing technology as processes rather than artifacts and (b) concern for the values and principles that direct and guide educational technology research.

DBR is an interdisciplinary, interconnected approach spanning educational technology, engineering, computer science, and architecture (Jacobsen, 2014). It is an approach that provides evidence-based inquiries to promote practical and affordable solutions, addressing issues based on the theoretical knowledge of particular fields (Barab & Squire, 2004). Anderson and Shattuck (2012) define DBR as "being situated in a real educational context" and "focusing on the design and testing of a significant intervention" (p. 16). Van den Akker et al. (2007) define DBR as a cyclical process similar to the process of educational research and instructional design due to the iteration process. For Wang and Hannafin (2005), DBR is "a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (p. 6). The iterative process occurs at every stage of the cycle—analysis, design, development, and evaluation—until the researchers approach the desirable results.

Bannan (2007) characterized the purposes of DBR as to generate through exploratory research, to improve through constructive research, and to learn about through empirical research. As shown in Figures 7, 8 and, 9, these processes of DBR are presented in different ways by various authors such as McKenney (2001), Bannan-Ritland (2003), and Reeves (2006). The ILDF developed by Bannan-Ritland is used as the guiding framework to conduct this dissertation study.
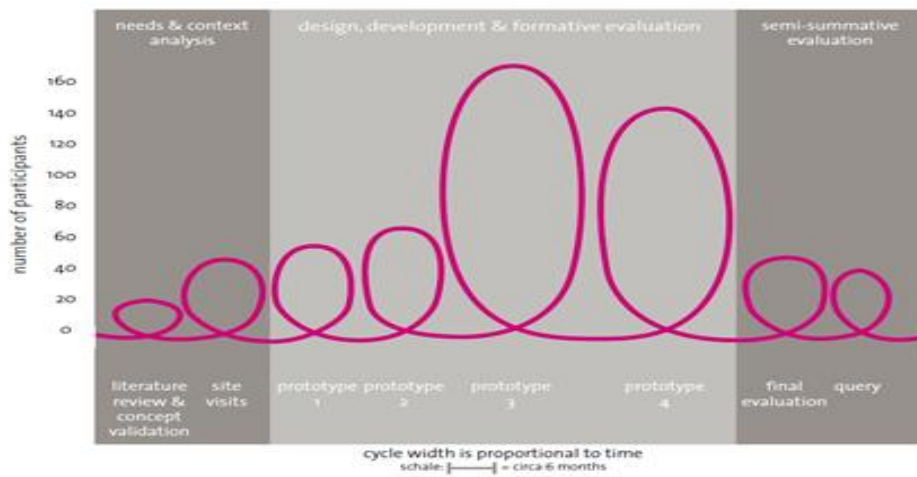
Figure 7. The cyclical process of DBR (McKenney, 2001).
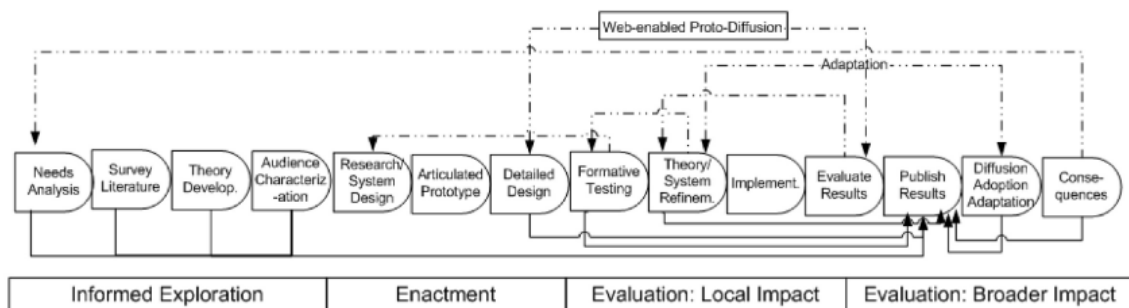
Figure 8. The Integrative Learning Design Framework (ILDF) (Bannan-Ritland, 2003).
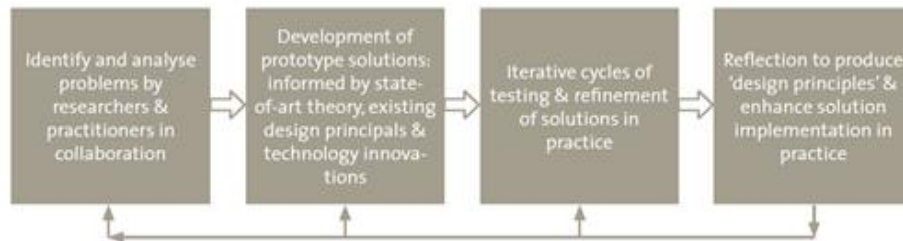
Figure 9. Design research approach (Reeves, 2006).

Integrative Learning Design Framework

Bannan-Ritland (2003) introduced the ILDF as "a guiding framework [and] a meta-methodological framework" (p. 55). This framework was developed by integrating the systematic processes of related fields such as instructional design, engineering, human-centered design, educational research, diffusion of innovation, and product design. The ILDF challenges researchers to explore an in-depth investigation through the DBR process for the entire project from early conception to completion. In this study, the current dialectic problem related to the possibilities of OER use in innovating teaching and learning practices was addressed using the ILDF, incorporating a combination of research methods in each phase (as shown in Figure 10). This DBR model aligns with the four phases of the ILDF: (a) informed exploration, (b) enactment, (c) local impact evaluation, and (d) broader impact evaluation (Bannan-Ritland, 2003). The informed exploration phase was conducted as initial micro-cycles of exploratory research before the execution of the proposed study in order to establish an understanding of the existing deficiencies in OER use. The following two phases—enactment and local impact

evaluation—constituted the proposed DBR study. Since this is a short-term dissertation study, the broader impact evaluation will not be a part of this study; it will be conducted later in different contexts for refinement and generalization purposes.

The ILDF process for conducting DBR is different than the process of traditional instructional design. The four phases of the ILDF incorporate multiple macro- and micro-cycles of rigorous and comprehensive mixed research methods to learn in-depth about the problem and to inform the design of context-based interventions or technology (Bannan, 2007). The interconnected research cycles help to generate theory assumptions or design principles related to the area under investigation (Bannan, 2007). The ILDF has specific questions and recommendations of research methods in each stage to guide researchers through the process of exploration, development, evaluation, and diffusion of the final products. The scheme and time frame for the proposed DBR are presented in Figure 10.
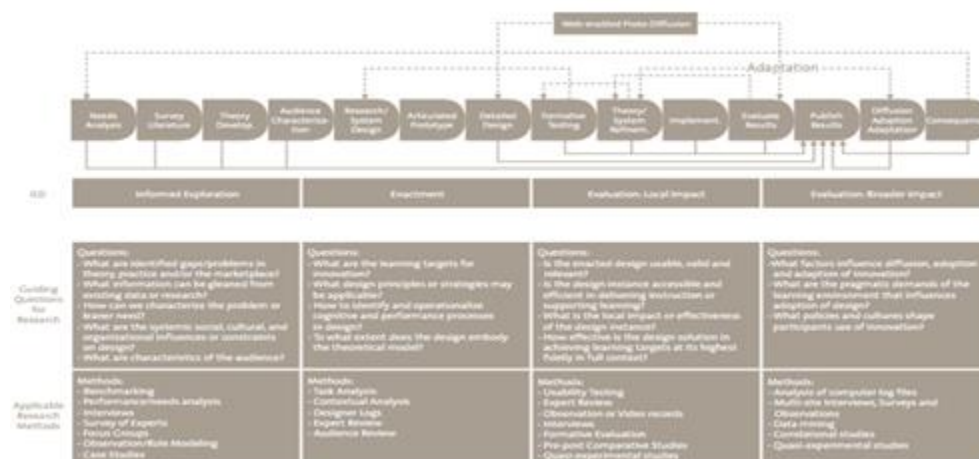
Figure 10. The four phases of the ILDF (Bannan, 2007).

Design Principles

Educational design research plays a vital role in making connections to fill theory-practice gaps. However, one of the criticisms of DBR as a methodology is that it lacks an obvious framework for capturing the evolutions in each phase and directing the inductive explanation about the emergent theories that result from the enactment phase of the designed solution (Kelly, 2004). Thus, conjecture mapping has been suggested as a path for capturing the design trajectory to conceptualize the basis or initial assumptions of the design principles for a learning environment design (Sandoval, 2014). Sandoval (2014) described conjecture mapping as mapping the features of a learning environment design so that a researcher can predict how these features work together to produce the desired outcome.

DBR aims not only to explain interventions' effects in learning environments, but also to formulate particular theories that appropriate a broader context. These theories are fundamentally generated in the form of design principles that are examined for a particular educational context (Euler, 2017; Reeves, 2006; van den Akker, 2007). Design principles are the essential pillars that support designing interventions either empirically, theoretically, or plausibly to approach the desired result (Euler, 2017). As a result, capturing the theoretical conjectures that explain how the elements of a designed solution will work together can potentially lead to the development of theoretically grounded design principles through DBR (Woznika, 2015). In this dissertation study, the initial theoretical conjectures are articulated in Table 3. The ultimate tangible outcome of the DBR is a set of design principles that further refine the theoretical understanding of the

problem being investigated (Mckenney & Revees, 2012). Similarly, Euler (2017) stated

that "within the process [of DBR], design principles initially constitute the result of the

theoretical foundation" (p. 9).

Sandoval (2014) articulated the essential elements of the conjecture map that

guide the development of design principles for a particular learning environment through

an interconnected process. The first is determining the *high-level conjectures* about how

to support the intended learning in a particular context, which are described as the

embodiment of a specific design. This embodiment is expected to create certain

mediating processes that produce the *desired outcome*. The mediating processes produce

the *design conjectures*, and the ways these support the desired outcomes are articulated as

the *theoretical conjectures*. Determining these features helps to inform the development

of the design principles of a proposed solution. Furthermore, Euler (2017) divided the

development of design principles into three main components: (a) learning objective of a

particular context; (b) specific teaching and/or learning activities that are linked to a

presumed consequence or impact, described as the medium to trigger the learning

activities toward attained outcomes; and (c) aspired learning goals, which are generated

from the consequences or the impact directly or indirectly.

In this dissertation study, the theoretical conjectures were produced through the

exploratory micro-cycles. They were used as a base for generating and refining the design

principles through the next phases of DBR, the enactment and local impact evaluation.

The design principles articulated how students can be engaged in a high level of OER

reuse and creation and how to validate that learners are active and visible participants in

the world of knowledge.

Pre-Dissertation Research

Phase One: Informed Exploration

McKenney and Reeves (2012) stated, "A problem well stated is a problem half solved" (p. 85). The primary goal of this phase is the analysis and exploration of the problem in a context. The analysis aims to define and determine the real-life problem carefully. The exploration aims to learn from other experts and scholars about the methods they used to solve similar problems, in order to gain a better understanding of the particular phenomenon and consider alternatives to improve relevant current educational practices (Edelson, 2006; McKenney & Reeves, 2012). In the current study, this informed exploration phase spanned four distinct micro-cycles of analysis and exploration (as shown in Figure 11): (a) two cycles of extensive literature reviews on OER to understand the current status of this phenomenon and define the gaps in research, as well as to explore the new trends toward advancing this movement; (b) a qualitative case study to determine the factors affecting adoption and non-adoption of OER, and (c) a mixed-method study to examine the concept of renewable assignments from student and instructor perspectives. These exploratory micro-cycles were conducted prior to intervention creation. The results of each micro-cycle informed the focus of the next micro-cycle to generate a holistic understanding of OER, and its associated components, and guided the next phase in integrating OER in higher education, as described by McKenney and Reeves (2012), in order to learn how they interact within a whole system. These exploratory micro-cycles are presented in Figure 11 in chronological order.

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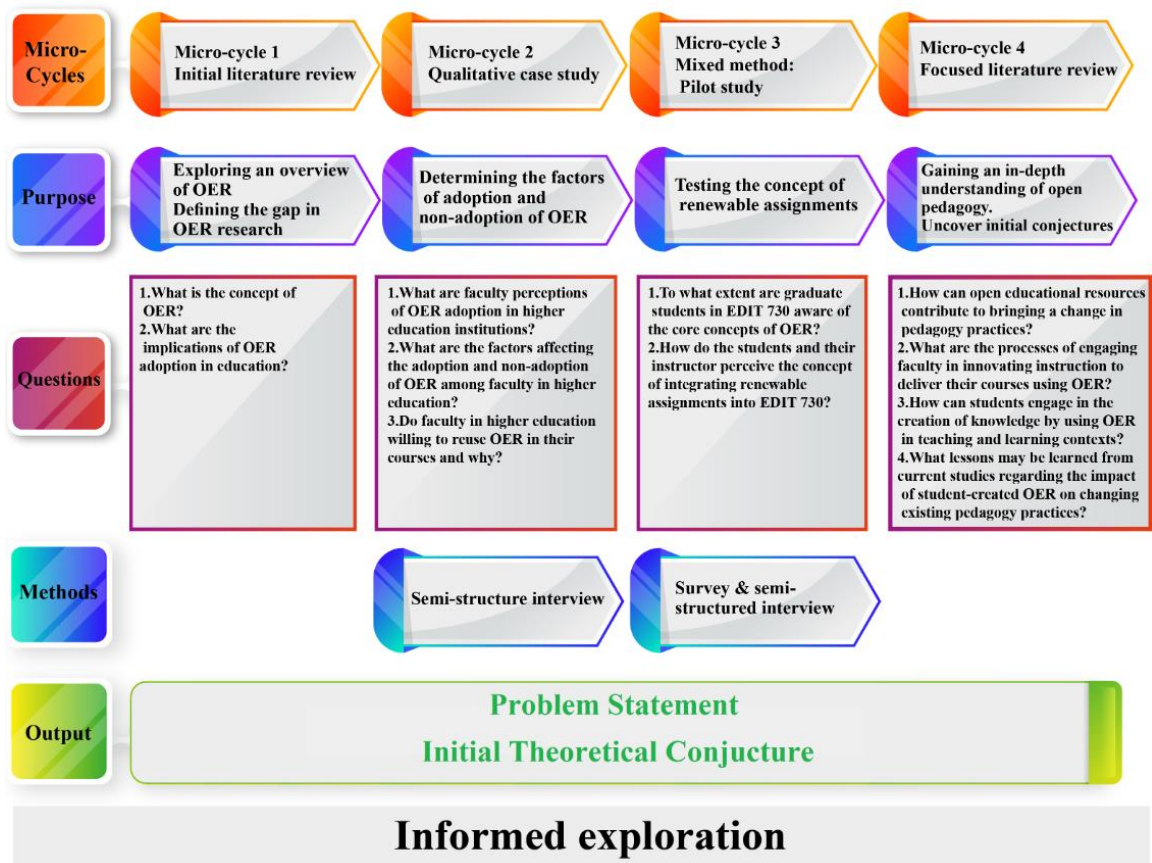
Figure 11. The exploratory micro-cycles of informed exploration phase (Spring 2017-Spring 2018)

Micro-cycle 1: Extensive literature review (initial review, Al Abri &

Dabbagh, 2018). The initial literature review in Spring 2017 was a broad exploration of

OER adoption in education as discussed in Chapter Two. This thorough review explored

the following aspects: (a) an overview of the concept of OER, including the history of

this movement; (b) various definitions of OER and associated components such as

openness and copyright licenses; (c) the current status of the applications and

implications of OER in education; and (d) the areas of strength and weakness (or

constraints) existing around OER adoption in education. As seen in Chapter Two, this

literature review defined the gaps in knowledge and claims for further investigation. Based on this initial literature review, an initial problem statement was drafted as follows.

Draft of the problem statement. The current status of OER adoption in education is minimal, and it has not expanded in higher education due to several obstacles that hinder the spread of OER at the local and national levels, such as the lack of awareness regarding the term *OER* and Creative Commons licensing as well as the 5Rs practices. The significant results of OER adoption include cost savings and sharing knowledge; the use of open digital textbooks can decrease textbook prices by 80%. The common belief is that OER might have other potential benefits besides cost savings, such as delivering unique pedagogy models and engaging students in knowledge creation. There are claims to provide scientific evidence regarding the benefits of OER in teaching and learning.

Micro-cycle 2: Qualitative case study (Al Abri, 2017). The William and Flora Hewlett Foundation (2013) asserted that understanding the factors leading to OER adoption is crucial to track the progression of the OER movement over time. Thus, tracking the factors that lead to and hinder the adoption of OER in the education sector helps to determine the successful parts and the parts that need more attention. In Fall 2017, a qualitative case study was conducted to explore faculty perceptions of OER in higher education institutions and the extent to which they were willing to reuse OER materials in their courses. We argued in this study that determining these factors would help instructional designers or other university professionals (e.g., librarians) design an intervention for helping faculty adopt OER in their courses with fewer or no constraints.

Instrument. This qualitative case study employed a semi-structured interview (Appendix A) to answer the following research questions:

RQ1: What are faculty perceptions of OER adoption in higher education institutions?

RQ2: What are the factors affecting the adoption and non-adoption of OER among faculty in higher education?

RQ3: Are faculty in higher education willing to reuse OER in their courses, and why?

The interview questions were developed to capture the drivers and obstacles that affect the degree of OER adoption from faculty's perspectives, and to explore the faculty's willingness to reuse OER in their courses. The inductive method of data analysis was adopted for this case study, moving from the particular to the general, and the generation of themes was based on the researcher's interpretation of participants' own experience and background. The thematic analysis involved finding the common features among cases that were used to construct the final thematic categorization of the data.

Participants. The targeted audience for this study was OER professionals/experts and OER leaders who had worked step-by-step collaboratively with faculty members in OER initiatives or projects at the institutional or statewide level. The goal was to explore the perceptions of faculty about OER from OER experts' perspectives. According to Guba and Lincoln (1994), relativists believe that reality is perceived in the form of multiple and intangible intellectual constructions that are shared socially and experientially among many individuals or different groups with different cultures. We

reached four OER leaders at Northern Virginia Community College (NOVA), Virginia

Tech University, George Washington University, and James Madison University (JMU).

They were involved in a variety of OER initiatives, such as the Z OER initiative on open

textbooks, Open Textbooks Network (OTN), Virtual Library of Virginia (VIVA), and the

Go Open initiative.

The researcher approached the participants of this study through the director of

Mason Publishing Group at George Mason University who is involved in a cross-

institutional group related to the use of OER in Virginia higher education institutions. He

contacted participants by email and provided them a brief introduction to the study.

Another approach the researcher used was contacting OER research fellows through the

website of Open Education Group. The researcher sent an invitation to eight researchers,

across Virginia State and Washington D.C. She introduced herself as a doctoral student

interested in exploring faculty perceptions of OER in higher education institutions and

invited them to participate in a semi-structured interview session via Skype. Once the

participants accepted to take part in the study, the researcher arranged a time for the

interview and exchanged the Skype accounts. The consent form was sent to the

participants for their review and signature prior the interview.

Results. The results of this study provided useful indicators regarding the factors

that affect faculty's decision to use OER in their courses. We learned that the critical

factors faculty want to see in OER content include competitiveness to replace commercial

textbooks, inclusiveness of the subject area, and flexibility of adaptation to meet learners'

needs. Moreover, low cost was deemed a critical factor for faculty at community colleges

due to students' budgets. Finally, providing a supporting team to work collaboratively with faculty step-by-step in adopting OER is a major factor to move the OER movement forward. Accordingly, the findings of this case study: (a) showed the perceptions of OER among faculty in these institutions, (b) identified the enablers and hindrances that influence OER adoption, and (c) described the faculty members' willingness to adopt OER in their courses, as discussed next.

Perceptions of OER. The faculty perceptions of OER were varied among the four higher education institutions. Data indicated that the awareness of OER among faculty at NOVA Community College was high due to the low cost of the open textbooks; the faculty were positive about using OER in their courses. However, the awareness of OER among faculty at public and private universities was low because they did not believe that their students had financial needs (as shown in Table 1)**.** Furthermore, faculty at these universities were skeptical and uncertain of what OER meant and what open resources offered. The participants believed that their uncertainty about OER was healthy skepticism because the transition from traditional textbooks to OER is a big leap and requires time to make a change.

Table 1

Faculty Perceptions of OER

Status of Perceptions	Participants' Responses
High	"The awareness of faculty about OER in community college is high because of the impact of OER in reducing the cost."
Skeptical	"The faculty is open to the idea of open, and simultaneously are skeptical." "Faculty perception at [the institution] [is] that students don't need for OER because they can afford the expensive textbook."
Ambiguous	"Most people don't know what OER means." "There is a lot of confusion." "There are a lot of faculty don't believe their students have financial needs which are not true."
Very Low	"I found that no anyone in the library heard or knew about OER."

Enablers and hindrances.

Enablers for adopting OER included these factors:

- The quality of OER materials, including competitors and robustness, peer review, and inclusiveness of OER resources.

- The supporting team and facilities: instructional designers, instructional technologists, librarians, and an ease-of-use platform.

- Flexibility: accessibility, full control of content, and creativity.

- Low cost.

The Hindrances included the following obstacles:

- Low quality of OER.

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- Insufficient relevant OER resources.

- Time-consuming process.

- Limited funding for creating and maintaining OER.

- Lack of support at an institutional level.

Willingness to reuse OER. On the question of willingness to adopt OER in the courses, generally, there was an interest among faculty in adopting OER as long as these open materials were robust and competitive with commercial textbooks. Moreover, offering support for faculty as well as ease of use and easy access to OER via a familiar platform could influence faculty to adopt OER. Finally, their willingness to reuse OER tied with illuminating the obstacles educators encounter in OER adoption.

Micro-cycle 3: Mixed method study (Al Abri & Dabbagh, 2019). The pilot study provided an opportunity to inform the researcher about the topic, and sought to develop new research questions. The overarching purpose of this pilot study was to examine the concept of engaging students in OER creation in a form of renewable assignments. Wiley (2013) uses the term renewable assignments to refer to an artifact that has personal meaning to students and is shared publicly under the open Creative Commons CC-BY license. The term renewable assignments is used interchangeably with student-created OER that defined as "an approach in which students are not just consumers of content but active and visible participants in the construction of knowledge" (DeRosa & Robison, 2017, p. 115). Specifically, this pilot study aimed: (a) to gain a better understanding of the impact of renewable assignments on student and instructor perceptions of the attributes of OER, (b) to identify the factors that motivated

students to adopt the concept of renewable assignments, and (c) to develop more targeted research questions for the next phase for the actual dissertation study.

Setting. The intervention was tested in EDIT 730, the Advanced Instructional Design course in George Mason University in the U.S. The EDIT 730 was chosen as a context for the implementation because the nature of assignments in this course were compatible with the concept of renewable assignments. As a result, appropriate OER content that aligned with the objectives of EDIT 730 was identified, and instructions and methods of assessment in relation to making students' assignments under CC license were developed. Students could choose to publish their works online under a Creative Commons license and control the copyright to their works. Instructors who teach this kind of course in other institutions can use these renewable assignments as examples and have freedom to practice the 5Rs (retain, reuse, revise, remix, and redistribute). In addition, the instructor and students can decide to assemble all the assignments to produce an open textbook encompasses case studies of constructivist learning environments. The works generated from this course promise to add to the body of knowledge in the instructional design domain over time, where the availability of OER content is insufficient.

Method. A sequential mixed method (a combination of quantitative and qualitative research methods) was adopted for this pilot study to explore the perspectives of graduate students and instructors on the concept of renewable assignments. Integrating quantitative and qualitative methods in a single study leads to an integrated explanation

of results from both methods in order to construct the conclusion of the study (Teddlie &

Tashakkori, 2009). This pilot study sought to answer the following research questions:

Q1. To what extent are graduate students in EDIT 730 aware of the core concepts

of OER?

Q2. How do the students and their instructor perceive the concept of integrating

renewable assignments into EDIT 730?

Instrument. A survey (Appendix B) was developed within SurveyMonkey, an

online survey medium. It was administered to students to explore their perceptions of

OER and the concept of renewable assignments, and to determine the factors that would

motivate them to share their assignments publicly under an open license. The survey was

developed based on the benefits of OER and the concept behind renewable assignments.

It consisted of 13 questions, including two unstructured questions, 10 structured

questions, and one rating question. One question used was based on an existing and

validated survey conducted by Allen and Seaman (2016), and another question was based

on a survey developed by Hilton and Wiley (2018) with the Open Education Group on

behalf of the University System of New Hampshire Open Education Initiative, adapted

by permission (Hilton, personal communication, January 31, 2018). The survey was

divided into three parts: (a) demographic information, including gender, length of work

experience, and job title; (b) awareness of OER, aiming to measure and describe

participants' thoughts on the value and quality of OER used as supplementary resources

in the course; and (c) participants' satisfaction with the concept of renewable

assignments, their willingness to adopt renewable assignments in future courses, and the factors and obstacles they faced.

In addition, an open-ended face-to-face interview (Appendix D) was used to gather qualitative data from the instructor of the course. It was a non-directive and general approach to gain an in-depth understanding of the instructor's thoughts about the concept of renewable assignments (Teddlie & Tashakkori, 2009). Questions relevant to the current paper sought the instructor's perspectives on the value of implementing renewable assignments in the class for both students and instructor, and the types of pedagogy practices that might support student-generated renewable assignments. Other questions addressed related topics such as motivating factors that might encourage students to turn their assignments into renewable assignments as a form of OER, as well as areas where the intervention could be improved for the next iteration of this research.

Sample. This pilot study used a convenience sample because it was easy to reach the participants through the instructor of the course. The participants were current graduate students (N=11) in the Instructional Design and Technology (IDT) program enrolled in the EDIT 730 course in Spring 2018, and the professor (instructor) of the course. All participants were novices in the use of OER.

Procedure. At the beginning of the Spring 2018 semester, the instructor introduced the researcher to the class as a doctoral student interested in exploring the concepts of OER and renewable assignments. Then, in week 2, the researcher gave a face-to-face presentation to the class about OER, Creative Commons licenses, and the concept behind renewable assignments, including the benefits students could accrue from

making their assignments OER in a form of renewable assignments. The researcher

created an account on Multimedia Educational Resources for Learning and Online

Teaching (MERLOT), which is an online repository for the submission of OER in a

range of academic disciplines for use by higher education faculty and students. After the

instructor evaluated students' assignments based on rubrics, the researcher sent an email

to each group and each student seeking their permissions to publish their assignments as

OER/renewable assignments in MERLOT. Once the researcher received the permissions,

she added the CC-BY license to their assignments and uploaded them to MERLOT under

the students' names. Then, the researcher sent the citations of the copyrighted works

hosted in MERLOT to the students so they could add them to their CVs and share them

with friends and colleagues. At the end, after students had been exposed to the

intervention of renewable assignments, they were asked to complete an online survey. In

addition, at the end of the course, the researcher interviewed the professor to explore her

points of view regarding integrating student-generated OER in her class in the form of

renewable assignments and discuss the area of improvement in redesigning the

intervention.

    Data analysis. Descriptive statistics were used to analyze the survey responses.

The data from the closed- and open-ended survey questions were analyzed

simultaneously, and interview data were analyzed after the interview with the professor.

Coding data, as well as the changeover process between data collection and the iterative

data analysis (Saldana, 2016) to search for meaning (Hatch, 2002), is a design decision

that must be systematically planned (Maxwell, 2011). Saldana (2016) stated that the code

is a "researcher-generated construct" and "an interpretive act" (p. 4). The researcher kept

an open mind during the coding of the data (Saldana, 2016). She listened to the interview

tape before transcribing it and read the interview transcript several times. While listening

and reading, she took notes and looked for patterns to explain and interpret the

instructor's perspective regarding the topic. The data from both the survey and interview

were presented thematically. Thus, after the interpretation, the researcher merged the

qualitative interpretation obtained from the responses to the open-ended questions with

the qualitative narrative data obtained from the interview. She looked at the whole set of

findings emerging from the interview and both the closed- and open-ended questions to

report the conclusion of the study.

   Result: Students awareness of OER. The first goal was to measure and explore

the awareness of OER among students in the course after they were exposed to it. The

responses shown in (Appendix C) indicate that among the eight participants, three

(42.86%) were knowledgeable about the term OER, two (28.57%) were very

knowledgeable about it, and two (28.57%) were somewhat knowledgeable about it. The

majority of participants, six (85.71%) students, chose promoting shareability as the

greatest benefit of OER, followed by four (57.14%) who chose equalizing access to

information for all, followed by three (42.86%) who chose personalized learning and

enhancing learning performance. When the participants were asked to rate the quality of

OER used in the course, five (71.43%) respondents rated it as about the same quality as

the traditional text assigned for this course. The databases the participants typically used

for their own searches included Google (100%) and Wikipedia (42.86%). No students

used open digital repositories such as MERLOT and OER Knowledge Hub. Only one participant reported using the Directory of Open Access Journal.

Result: Students' perceptions of renewable assignments. The second goal was to explore participants' satisfaction with the concept of renewable assignments, their willingness to adopt renewable assignments in future courses, and the factors and obstacles they faced. As indicated in Appendix C, only six participants responded, of whom three (50%) were very satisfied, two (33.33%) were satisfied, and one (16.67%) was somewhat satisfied with the concept of renewable assignments. One of the participants who was very satisfied valued the idea of sharing assignments with future students in this class, and found it helpful to see other students' work samples for the same projects the participants were working on. Table 2 shows the influencing factors that contributed to adopting renewable assignments.

Generally speaking, the students tended to endorse sharing works with others and publication credits more than factors such as intrinsic motivation, the pleasure of being involved in peer production, and stimulating innovation. One participant was influenced by understanding OER from the content creator perspective. When the participants were asked if they would be willing to publish their future assignments for other courses in open digital repositories with others under an open license, five (71.43%) respondents were quite willing to share future assignments in public, and two (28.57%) were uncertain about publishing their works because they were still on the fence about OER. Participants' responses regarding what they liked best about the renewable assignments approach in EDIT 730 included the availability of OER online, helping others in

immediate work or community learning, sharing knowledge and personal credit, removing financial barriers to knowledge, and finding it helpful to look at work samples of students going through the same program or course. The main barriers that kept participants from publishing their assignments under the Creative Commons license included deficiencies of quality or professionalism in the work, lack of peer review, and worries about the ability of others to change the work without consulting them.

Table 2

Factors Influencing Adoption of Renewable Assignments

Answer Choices	Responses
Publication credit	42.86%
Intrinsic motivation	28.57%
The pleasure of being involved in peer production	28.57%
Sharing work with others for educational purposes	57.14%
Stimulating innovation	14.29%
Other (please specify)	14.29%

Result: Instructor's perceptions of renewable assignments. The instructor perceived that the idea of renewable assignments was exciting because it engaged both students and instructor in the development of OER materials. However, there were

difficulties in the implementation process, such as finding good-quality OER and a cohesive collective list of OER that could be used over time, as well as determining how faculty could balance resources to use as formal reading versus OER reading. One issue related to the quality of OER is the difficulty of continually assessing its quality, as these resources keep changing over time through the 5Rs practices. The instructor believed that the primary value of renewable assignments for students was letting students feel they owned their assignments and could do something with them, such as putting them up for public consumption. These virtues of renewable assignments encourage students to become more proactive and value their assignments beyond the course limits. Another source of value was that OER like renewable assignments might become citable; people would cite them when they used them, and the students can add them to their CVs.

The instructor argued that the value of renewable assignments for faculty was the chance to compile activities done in a course into a publication online under a Creative Commons license and add it to their CVs in a section such as "non-refereed journal articles." The instructor stated that students' awareness of the concept behind renewable assignments motivated them to be more engaged in making their assignments open and publishable publicly. Another motivating factor was students' willingness to go back and spend the time to polish their assignments to make them publishable. Students could receive good feedback from the public over time, not only from the instructor and peers, for improvement purposes.

The interview data suggested that current pedagogy practices may or may not need to change to support student-created renewable assignments. Such a result coincide

with the recent study by Masterman (2015) which found uncertainty of whether openness necessitates a radical change in an institution's pedagogic practices or whether it can co-exist with the current approach. If there is a need for a change, it may lie in including feedback given to previous classes on their assignments for current students before they use them as best practice models. That is, the instructor mentioned that students were mimicking the best practice assignments without having more information about whether these models represented good implementation. Another change that can be made is not showing students the best practices from previous classes. Instructions can be included in the assignments to have them go out and look for examples by themselves. This may engage them more to find best practices for implementation and critique them for further improvement.

It was suggested that one area of improvement for redesigning the intervention of renewable assignments for the next class would be to integrate the instructions for the assignments as a part of the class instead of making them an add-on for extra credit. This result suggests developing a guide for students on how to do renewable assignments in the syllabus of the course. Instructions for the assignments should be added to the guidelines, such as listing OER resources for students to use and instructions to include the Creative Commons link in the assignments and upload them to MERLOT. In addition, the instructor suggested adding official processes of peer review among students (e.g., commenting on assignments through WordPress). The instructor also believed that creating a rubric to assess the quality of these assignments could help to ensure their quality before posting them publicly.

Micro-cycle 4: Focused literature review. The exploration phase is an open-ended and ongoing process of discovering and learning (McKenney & Reeves, 2012). The overarching purpose of this literature survey was to gain an in-depth-understanding of the gaps that are defined in the first micro-cycle of the initial literature review. Specifically, this micro-cycle included an extensive review of the literature on the potential benefits of OER for changing existing pedagogy practices and engaging students in the reuse and creation of knowledge. Moreover, this literature review intended to uncover the initial conjectures or existing theory or design principles that articulated the relationship between openness and existing pedagogy practices in teaching and learning with OER use. This literature surveyed was discussed in Chapter 2. Gaining an in-depth understanding of the theoretical assumptions behind open pedagogy and utilizing the lessons learned from best practices of students' engagement in knowledge creation led to revising the problem statement and defining areas for further investigation, which is the focus of this dissertation study. Moreover, it helped to determine the initial theoretical conjectures and inform the necessity of developing design principles for OER integration in courses in higher education institutions.

Initial theoretical conjectures.

Since the purpose of this DBR is to generate design principles that support the integration of OER toward OEP, and to inform the OER intervention design, the four micro-cycles of the exploration phase (initial literature review, qualitative case study, mixed method study, and focused literature review) helped generate the initial theoretical conjectures, These initial theoretical conjectures fed the next phase of the ILDF, the

Enactment Phase (design and construction) for generating the design principles of OER

integration in a college course. Bannan (2007) described these initial theoretical

conjectures as the central preface and wide orientation for the design research. The

researcher briefly summarized these initial theoretical conjectures in Table 3.

Table 3

Initial Theoretical Conjectures

Theoretical foundation	Design/intervention components	Delivery format of the design/ intervention	Drivers of OER adoption	Barriers
Attributes of 5Rs permissions	Creative Commons permissions	Transparency, flexibility, credibility, creativity	The quality of OER materials	Low quality of OER
				Insufficient relevant OER resources
Offer access to knowledge for everyone	Eliminate disposable assignments	Hybrid models	Supporting team and facilities	
		Flexible learning	Flexibility	Time-consuming process
Reduce the cost of education	Implement effective OER practices such as editing articles in Wikipedia	A Collaborative effort among instructors and students	Low cost	Limited funding for creating and maintaining OER
Deliver greater learning efficiency			Efficiency of learning	
Promote continuous improvement in pedagogy models	Develop renewable assignments shared publicly under CC license	Flexible transformation from accessing OER to open practice	Usefulness of OER	Lack of support at an institutional level
			Self-efficacy	Difficulties finding proper OER
Open pedagogy changes the way individuals learn, allowing them to learn in new ways and decide what and how to learn	Innovate open pedagogy based on practicing the 5Rs activities in teaching and learning practices	Degree of openness and the level of pedagogical model (high level, learners determine objectives, learning paths, self-regulated learners)	Scientific evidence for OER, effective and credible	Lack of remixing and revising OER
			Availability of OER	
		A pathway of transformation from resources to practices	Ease of use	
Individuals learn by doing	Engage students in knowledge creation			

			Faculty have full control of OER content
Students as visible and active participants		Teachers supporters	
	Use OER as an integral component in the syllabus to promote creating renewable assignments	Sharing culture and trust	Sharing for the benefits of others
Learner-centered approach			
		Social-network-based forms of learning	Credits for publications: the renewable assignments are citable so students and instructors can add them to their CVs
Learner is motivated to share works with others			
	Develop assessment methods such as rubrics and peer review to improve the quality of renewable assignments	Encouraging novel pedagogical models	
OEP improving the use of OER (remixing and revising OER)			
		Learner generated	Spur joint collaboration with other peers
		Reflective practices	
		Peer review	Promoting authentic learning in teams
	Generate a guide for students on how to develop the renewable assignments in more detail	Learning context is a platform of interaction, collaboration, exploration, and engagement in knowledge construction	Providing a space of flexibility and a condense on the process of collaborative learning
			Students and instructor are satisfied with renewable assignment in EDIT 730
	Encourage students to reflect about their learning and value their works beyond the boundaries of the classroom		Sharing exemplary works for later students encourages shareability of renewable assignments

| | Utilize the matrix of open pedagogical model and levels of openness (Ehlers, 2011) |
| | Increase the awareness of OER |

Intervention outcome

- Generate formal guidelines for faculty to integrate OER in courses.

- Produce quality OER materials that are free, open, and accessible for everyone.

- Increase the awareness of OER among students and faculty at the research university and internationally.

- If OER are effective and credible, they will be used as the primary resources for teaching and learning in higher education institutions.

- Practicing the 5Rs framework in authentic learning.

Dissertation Research Study

Phase Two: Enactment

  The Enactment Phase, also called the design and construction phase according to McKenney and Reeves (2012), encompassed generating the design principles and the intervention intended to address the particular educational problem. Based on the current understanding of the problem pertaining to the use of open educational resources, this Enactment Phase had two goals: (a) generate design principles that articulate the integration of open educational resources (OER) in a college course, for more openness in teaching and learning practices to manifest in open educational practices (OEP); and (b) design an OER intervention as a means of shifting from merely providing access to open resources to creating, remixing, and revising OER. This intended OER intervention is considered a prototype for testing its effectiveness in achieving the intended goals. According to the Integrative Learning Design Framework (ILDF; Bannan-Ritland, 2003), this phase addresses the learning targets for innovation. This innovation articulates the design principles for the intervention and its operationalization in supporting two aspects: students' usage and creation of knowledge, and instructors' innovation in pedagogical models of the course. This is the overarching question that guided this phase:

  Research Question One. What are the design principles that support the integration of OER in a college course?

These are the sub-questions underlying this Enactment Phase:

A. What instructional materials and learning strategies will be used to direct students toward OER use and creation?

B. How can the 5Rs be integrated in a college course to support students' usage and creation of OER?

A slight change was made to the sub-questions of this phase. The initial focus of the investigation in this study was on students' contribution to OER creation as a means of extending the employed intervention of testing the concept of renewable assignments in the pilot study mentioned in the Informed Exploration Phase, particularly the student-created OER approach. However, while conducting the iterative cycles of development and design in this Enactment Phase, it became apparent that the focus should include both the usage and creation of OER that would promote OEP. So the intervention was modified to direct students toward both OER usage and creation through embedding instructions in the curriculum of the course.

Setting. The first step in conducting any research design is "defining the unit of analysis" (Yin, 2003, p. 46). The unit of analysis for this study was the course EDIT 730: Advanced Instructional Design. The course was chosen in the pilot study in the Informed Exploration Phase, which is offered in the Instructional Design and Technology master's program at the research university. Fundamentally, the EDIT 730 course was designed to expose students to the knowledge and skills for developing highly contextualized, engaging, and meaningful learning experiences based on the principles of constructivism, situated cognition, and connectivism. This course is delivered online (75% or more) using

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an asynchronous format via the Learning Management System Blackboard (LMS Bb) as well as through face-to-face lectures. It includes a combination of individual and collaborative activities, performance-based assignments, and in-class and online participation. The process of designing the OER intervention (as described below) was based on the syllabus of this course and was built in the LMS Bb.

There were four reasons for selecting this course: (a) The objectives of the course involved promoting individual and group construction of knowledge through constructive assignments and both in-class and online learning activities that emphasized students' contribution to the world of knowledge, (b) the collection of renewable assignments that students in previous classes shared and published in MERLOT under a CC license was used as a base of OER that provided current students the opportunity to use the 5R practices on them to improve their quality or to build new OER content, (c) in general, OER content in the instructional design discipline is insufficient, so publishing renewable assignments from this course will contribute to increasing the number of OER publications in this discipline and will allow the refinement of these resources over time, and (d) it offered easy access to participants through the instructor, who was interested in testing the concept of students' reuse and creation of knowledge in the form of renewable assignments.

Intervention. The purpose of designing the OER intervention in EDIT 730 was to examine if OER can impact or innovate the current pedagogy of this course by supporting the usage and creation of OER to promote OEP. Thus, OER was integrated as a main component in the course syllabus. The main activities to support the process of this OER

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integration were locating OER resources that align with the main objectives of this course (which are related to the content of constructivism and connectivism) and integrating OER in the instructions of the main assignments of the course by engaging students in the 5Rs practices. To do so, students enrolled in the current course had a collection of OER renewable assignments for students from previous classes (Fall 2017, Spring 2018, and Spring 2019) as a base for practicing the 5Rs activities. The previous students gave permission to make their assignments available under a CC license. These OER renewable assignments were published online in MERLOT and WordPress. The intervention's initial focus was on the student-created OER assignments. Later, based on the act of implementation and evaluation of the intervention in EDIT 730, it was evident that the intervention was about both about usage and creation. The instructions embedded in the course curriculum included guiding students to use and repurpose the previous assignments as well as to share their assignments under a CC license. As a result, the intervention changed to include both the usage and creation of OER, hence the research questions changed accordingly for this phase. In addition, evaluating this OER intervention in terms of usage and creation contributed to providing an evidence base for the debate in the OER movement in relation to improvement in the use of OER beyond accessibility and the best practices to combat deficiencies in the revising and remixing practices.

Micro-Cycles of the Enactment Phase

The Enactment Phase consisted of two sequential micro-cycles of design and development for the intended OER intervention. These micro-cycles provided two

iterations of development and refinement to generate the design principles of OER

integration in EDIT 730 and design the OER intervention prototype. Each micro-cycle

stands alone with its particular participants, data collection, and data analysis. The first

micro-cycle informed the second micro-cycle.

Micro-Cycle 1: Generating Design Principles and the Intervention's Components

The main purpose of the first micro-cycle was to generate the design principles of

OER integration into EDIT 730 alongside a detailed document describing the

components of the intervention prototype (Appendix E). Generating the design principles

facilitated the development of the instructional materials and learning strategies that

supported the integration of OER into the selected course as a means of opening teaching

and learning practices. This generation and development process passed through multiple

iterative rounds of refinements to reach the desired result of a high level of openness in

pedagogical practices and learning architecture.

Recruitment of participants. For this first micro-cycle, the researcher

purposefully selected the sample: educators with expertise in instructional design,

teaching and learning, and OER adoption. This purposeful sampling is homogeneous

sampling because the participants share similar characteristics in teaching, learning,

course redesign, and well-acknowledged of the OER movement (Glesne, 2016). The

sample for Micro-Cycle 1 consisted of six participants from the same research university

that was selected for the intervention execution and two external OER experts. Here are

descriptions of each person in the sample.

Six participants from the research university

1. The EDIT 730 course instructor. She has a considerable experience in instructional design and technology. She has 20 years' work experience. Her research focuses is on the pedagogical ecology of technology-mediated learning environments with the goal of understanding the social and cognitive affordances of learning systems design**.** She first heard about OER from David Wiley at the Association for Educational Communications and Technology (AECT) conference. She and a colleague had written a chapter in Wiley's book about learning objects.

2. The Director for Digital Learning at the University's Center for Teaching and Learning. He has seven years of ID experience supporting faculty to improve their courses. He has supported faculty from all disciplines in incorporating digital tools effectively into blended and online courses. He became familiar with OER when the State of Virginia established the "Open Virginia" initiative for universities and librarians around the state to introduce OER as open textbooks and open individual items.

3. The Assistant Director of Digital Learning at the University's Center for Teaching and Learning. She has worked at the research university for four years. Her focus is on assuring the quality of online courses and programs alongside faculty development and services. She is familiar with OER from her involvement at her previous institution in the conversion of all courses to use OER. Over one and a half years, faculty, librarians, and instructional designers worked collaboratively to find OER and modify them for the

courses. She attended several OER conferences with colleagues from the university.

4. An education librarian who has worked at the research university for eight years. She provides academic instruction, sessions, seminars, course support, and one-on-one research assistance to faculty, staff, and students of the College of Educational and Human Development of the research university for different disciplines. She is involved in the process of selecting, recommending, monitoring, evaluating, managing, and promoting print resources and electronic resources for higher education in collaboration with faculty from assigned academic programs. For several years, she has been involved in trying to push OER forward at the university to provide open content for faculty and students.

5. The Director of the Publishing Group at the research university's press. He has held this role for eight months. He worked in scholarly communication in private publishing for a number of years and as an editorial director at two other large state universities. He became familiar with OER five years ago at a conference by SPARC, a global coalition that empowers people to solve complex problems and make new discoveries through the adoption of policies and practices that advance open education, open access, and open data.

6. A Ph.D. candidate in Learning Technologies Design Research (LTDR) who was previously enrolled in EDIT 730. She has a master's degree in instructional design and two years' experience as an instructional designer.

She learned about OER from a colleague. Her research focus is the integration

of formal and informal learning activities to advance students' knowledge and

skills related to instructional design.

Two OER experts

These experts were selected based on their experience in leading OER initiatives

in higher education at the institutional, national, or international level.

1. Maha Bali is an Associate Professor of Practice at the Center for Learning and

   Teaching at American University in Cairo. She teaches digital literacies and

   intercultural learning to undergraduate students. Currently, she is co-facilitator

   (with Catherine Cronin and Mia Zamora) of Equity Unbound, an equity-

   focused, open, connected intercultural curriculum. Her research interests

   include openness in education, critical thinking, critical pedagogy, hybrid

   pedagogy, and emerging technology for online learning. She was invited to

   give the keynote address at the OER17 conference.

2. John Hilton is a Professor of Religious Education at Brigham Young

   University. He is passionate about teaching and learning and believes that

   learning happens when learners can act on the things they are learning. He is

   one of the primary researchers with the Open Education Group and received

   the Open Education Award for Excellence in 2017.

The six practitioners from the research university worked collaboratively with the

researcher of this study to produce formal guidelines represented in the design principles

and a detailed design document of the intervention's components to support faculty in

integrating OER into their courses at a high level of openness in pedagogy practices and learning architecture. The two OER experts reviewed the design principles and the detailed design document, including the developed instructional materials and learning strategies; the experts provided their input for refinements, as discussed in Chapter Four.

Data sources and instruments. An exploratory qualitative case study was used in this first micro-cycle to collect and analyze data that guided the generation of the design principles of integrating OER to manifest in OEP in the EDIT 730 curriculum; this informed the design of the prototype OER intervention. According to Smith (2011), a case study must encompass two components: the subjects of the case study (the participants described earlier), and the object of the case study, which was the participants' input toward the design of the prototype OER intervention.

These are the data sources and instruments used to inform this micro-cycle in the Enactment Phase, the exploratory qualitative case study:

1. The syllabus of EDIT 730, focused on understanding and designing constructivist learning environments

2. A backward design model, a curriculum design method developed by Wiggins and McTighe (2006). This helps instructors to conceptualize a course by defining the overall desired goals of the course, then moving to determine learning outcomes, learning activities and assignments, educational resources, and assessment methods. It consists of three stages: identify desired results, determine acceptable evidence, and plan learning experiences. There are several questions under each stage that guide instructors to design

the components of the course. The three stages of the backward design model was used to guide the discussion and activities of the focus group session.

3. A course mapping developed by the Center for Teaching and Learning at the research university. This is a useful visual tool for designing and redesigning a course that helps instructors address how to approach and assess each student's learning outcomes defined in the course. This visual tool was used in parallel with the backward design model.

4. A matrix of pedagogical levels and learning architecture, based on Ehlers' (2011) degree of openness in the use and creation of OER. This matrix was used to position and determine the current pedagogical practices used by the instructor of the course.

5. The initial theoretical conjectures derived in the Informed Exploratory Phase (illustrated in Table 3)

6. The inputs of the Informed Exploration Phase and its results based on the students' and instructor's perspectives about the concept of renewable assignments

7. A focus group session with the six participants and subsequent one-on-one interviews with three participants in this micro-cycle based on their inputs in the focus group session. According to Burke, Johnson, and Christensen (2014), a focus group is defined as "a moderator leads a discussion with a small group of people" (p. 234). For this first micro-cycle, the small group of people were the participants from the research university, as described above.

The focus group was used to stimulate new ideas and creative concepts

regarding the process of engaging faculty in innovating pedagogy practices to

support students in OER usage and creation and also to propose creative

instructional and learning activities toward integrating the 5Rs into the EDIT

730 learning environment. The purpose of conducting one-on-one interviews

after the focus group session was to get more depth and detail on the ideas

generated by some participants in the focus group discussion.

8. Expert review: Fundamentally, expert review encompasses several methods

of reviewing such as heuristic evaluation and design critique (Harley, 2018).

In this study, the expert review took place in the final stages of this first

micro-cycle in the form of design critique by two external experts based on

the expert's experience in leading and mentoring the use of OER in teaching

and learning.

Procedure. The first step of this first micro-cycle was generating the design

principles based on state-of-the-art knowledge and empirical findings obtained from the

Informed Exploration Phase discussed in Chapter Two. The researcher used these design

principles to develop questions for the focus group (Appendix F) to ensure the alignment

of the design principles and questions to reach the intended results. Subsequently, the

visual course map shown in Table 4 was created, based on the syllabus of EDIT 730. This

map was used as the starting sketch of the course design discussed in the focus group

session. It shows the alignment grid of learning outcomes of the course and the

description and instructions of the current learning experiences (main assignments). A

column was added to suggest the additional resources that might be available to support faculty in engaging students to repurpose and create OER, the techniques for operationalizing the 5Rs in the instructions of the main assignments, and the technology that would be used for sharing and publishing OER renewable assignments.

Participants were recruited through email. The researcher introduced herself as a doctoral student exploring the effectiveness of OER use in teaching and learning practices and explained the purpose of the study. Once the researcher received the participants' acceptance, she sent them the consent form and arranged dates and times for a meeting. Prior to the meeting, the researcher sent the participants a 10-minute narrated introductory presentation that introduced the OER movement, highlighted the emerging developments in OER, explained the purpose of this study and the big ideas of the focus group meeting, and provided examples of initiatives from professors from different disciplines around the world in relation to encouraging students' contribution to OER usage and creation.

The focus group meeting lasted for two and a half hours; audio and video were recorded. The researcher started with thanking the participants for their participation and briefly explained the focus and scope of the focus group session. Next, all participants joined icebreaker activities such as sharing names, departments, roles, and work experiences, including the length of their service and their acknowledgment of OER. Finally, they shared "shining moments" of achievement in career or life. The researcher used a combination of open discussion and work activity notes for generating ideas from the participants. The participants were divided into two groups to work on the assigned

activities, as shown in Figure 12. Posters highlighting the definitions of OER, OEP, open

pedagogy, disposable assignments, renewable assignments, the 5Rs, and different types

of CC licenses were hung on the wall to draw participants' attention to the focal pillars of

the discussion. The researcher used the three stages of the backward design model to

guide the discussion and activities of the focus group session (Appendix G). The matrix

of open pedagogical models and learning architecture was used to position the current

pedagogy practices used for teaching the course and define the level of openness

necessary to accomplish the purpose of this study, which was students' usage and

creation of OER (Figure 2). Immediately after the session, the researcher started

analyzing the data and adding participants' inputs and ideas in a template pertaining to

the backward design model (Appendix E). After analysis of the focus group data, the

detailed document describing the components of the OER intervention was initiated.

Figure 12. The participants were working in groups to restructure the instructions of the
main assignments

Based on the results of the data analysis from the focus group discussion, one-on-one interviews were set up with only three participants, where the researcher sought more clarification on their inputs in the focus group session, in order to advance the understanding of their perspectives in the discussion session regarding some aspects of the course design. Prior to conducting the interviews with the participants, the researcher sent them the first draft of the detailed document of the intervention's components, for their review and feedback. The participants' feedback is included in the results of this study, discussed in Chapter Four. For the one-on-one interviews, specific questions were developed for each participant in order to fill the gaps in the detailed document (Appendix H). Each interview lasted about 30-45 minutes.

As previously discussed, there were two prospective products of this first micro-cycle: (1) the design principles of OER integration that would manifest in OEP; and (2) a detailed document that articulates the integration of OER usage and creation in EDIT 730, including restructuring the instructions of the main assignments, operationalizing the 5Rs, sharing and publishing OER renewable assignments, and developing criteria for assessing the quality of students' assignments before releasing them online under a CC license. As a result, having the final products of this first micro-cycle, the two OER experts were invited to review the generated design principles and the final draft of the detailed design document, based on their wide experience in the use of OER. The researcher requested a written document of the experts' feedback, for further refinement. This expert review occurred only once, since the document went through iterative cycles of development and refinement prior to their reviews.

Data analysis. Qualitative data analysis involves many ways of analyzing participants' responses, and there is no fixed rule for selecting appropriate methods (Teddlie & Tashakkori, 2009). The data analysis process of this phase occurred sequentially, starting with analysis of the data of the focus group discussion, followed by analysis of the one-on-one interviews, then analysis of the expert reviews of the design principles and detailed design document. Onwuegbuzie, Dickinson, Leech, and Zoran (2009) stated that there is no framework delineating the techniques for analyzing qualitative data that could guide the process of analyzing the focus group discussion data.

To begin the analysis process, the researcher immediately transcribed the audio-video recording of the focus group session and listened to the recording several times, which helped to yield new information. Teddlie and Tashakkori (2009) asserted that the process of analyzing qualitative data is iterative and requires "a back-and-forth process between data collection and data analysis" (p. 251). As discussed earlier, the researcher used both activity notes and open discussion in the focus group session. First, to analyze the activity notes, the Work Activity Affinity Diagram (WAAD) technique was used (as shown in Figure 13) (Hartson & Pyla, 2012). The WAAD technique was used to organize and regroup insights and ideas that were generated across the participants during analysis of the activity notes. This technique helped to determine the knowledge, skills, and enduring understanding that students should have after completing the course; these are discussed in Chapter Four.

The second step of the data analysis was to analyze the data obtained from the open discussion session using open-coding with the MAXQDA software for qualitative

and mixed methods research (Glesne, 2016; Maxwell, 2013). After completing the

transcribing process, the researcher read and listened to the transcript many times, to

confirm the accuracy of the transcription and to create an overview of the participants'

insights regarding integrating OER in EDIT 730 (Maxwell, 2013). At this stage, the

researcher used line-by-line open coding and generated tentative themes or categories.

Reading line-by-line was repeated several times, attempting to group the generated codes

under substantive categories (Glesne, 2016; Maxwell, 2013).
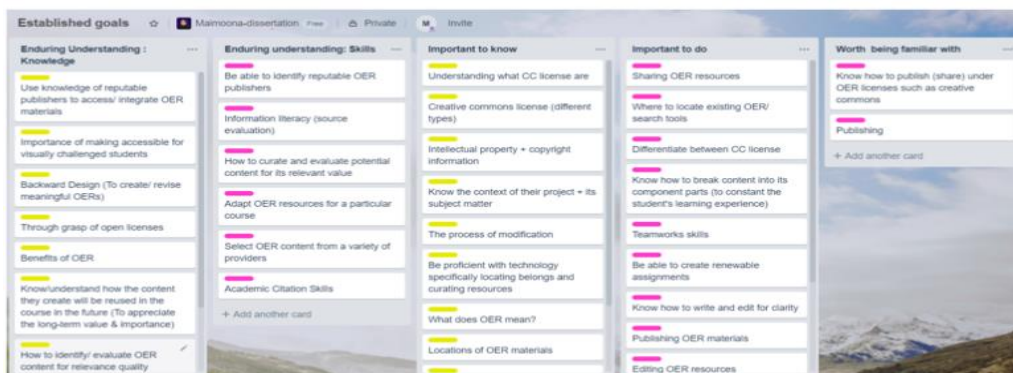
Figure 13. An example of the Work Activity Affinity Diagram (WAAD) technique
that was used to group ideas across participants during analysis of the focus group data

In the third step of the data analysis, the researcher transcribed the audio recordings of the three one-on-one interviews and listened to the recordings several times. After the transcribing process for each interviewee, the researcher analyzed the data using the MAXQDA software. Subsequently, all the ideas of the participants were classified under substantive categories. Finally, the researcher compiled all these substantive categories from the focus group discussion and the interviews to create broad themes called "organizational categories" (Maxwell, 2013). These organizational categories represented the overall components of the OER intervention. Subsequently, based on the data obtained from the focus group and the interviews, the researcher filled in the template of the backward design model; this was the start of generating the detailed document of the course design toward OER usage and creation. In the end, the researcher shared the final draft of the detailed document with the participants for their feedback and comments. Finally, to analyze the experts' review, the researcher used the MAXQDA software for coding and analyzing the written documents, and then used their input to refine the design principles and the detailed document representing OER integration into EDIT 730.

Table 4

Visual Course Mapping: Learning Outcomes, Learning Experiences, Resources, 5Rs Integration, Technology

Learning Outcomes What will students be able to do at the end of the course/sequence?	Learning Experiences How should the assignments in EDIT 730 be restructured to direct students toward OER usage and creation?	Additional Resources and Technology Tools How are the 5Rs operationalized?
1. Develop an understanding of epistemological approaches to learning and cognition such as objectivism, behaviorism, cognitivism, constructivism, situated cognition, and connectivism. 2. Develop an understanding of grounded design (theory-based design). 3. Develop an applied understanding of constructivism and its implications for designing meaningful learning experiences using the Meaningful Online Learning Design Framework.	A. Constructivist Learning Environment Criteria and Applications In groups, students will (a) identify theoretical principles and instructional characteristics of Constructivist Learning Environments (CLEs) based on the readings and additional reliable resources, (b) contrast these to the theoretical principles and instructional characteristics of Objectivist or Behaviorist Learning Environments (OLEs), (c) find and share an example of a CLE that is technology supported and subscribes to the CLE principles and characteristics identified, and (d) critique the extent to which the selected CLE example embodies the principles of constructivism. The end product for this assignment is an in-class presentation of 20-25 minutes that describes the findings of the group with respect to these items. More detail is provided on the course website under assignments.	OER reading materials Examples of OER renewable assignments in MERLOT from previous students

4. Examine a variety of constructivist-based pedagogical models and instructional strategies and their implications for the design of meaningful learning experiences using a variety of learning technologies.	B. Research Brief Each student will select a constructivist-based pedagogical model (e.g., cognitive apprenticeship, community of practice, situated learning, problem-based learning) OR an instructional strategy (e.g., collaboration, articulation, scaffolding, problem solving), OR a learning technology (e.g., immersive tools, collaboration tools, knowledge representation tools) and write a research brief based on the *5 Things You Need to Know About*: (1) What is it? (2) How does it work? (3) Who is doing it? (4) How effective is it? (5) What are its implications for instructional design? References should include course readings as well as new empirical research related to the selected model, strategy, or technology.	Instructor's video overview of the Research brief Lists of research journals and library search, including open access journals APA style resources Examples of OER renewable assignments in MERLOT for previous students
5. Appreciate the importance of the linkage between theories of learning and instructional design practice.	C. Designing a Technology-Supported Constructivist Learning Environment (TSCLE). Individually or in small groups, students will select a constructivist-based pedagogical model or the meaningful learning characteristics and will apply a grounded design approach to develop a prototype of the TSCLE for a specific target audience and learning content. The prototype will demonstrate how supportive, dialogic, and	Final project proposal outline Questions to ask when beginning to design a constructivism learning environment (CLE) Examples of assessing learning in CLE Examples of OER renewable assignments in MERLOT for previous students

exploratory instructional strategies are implemented.

The final deliverable for this assignment should include the following three components:

1. A proposal (design document) describing the parameters of the TSCLE: the learning problem, target audience, learning outcomes (knowledge/skills/content), pedagogical model or meaningful learning framework, instructional strategies, learning activities, learning technologies, and assessment approach.

2. A design table showing the grounded design of the TSCLE. The table is a blueprint or storyboard of the prototype and should illustrate the mapping or alignment of the following design elements: (1) learning outcomes, (2) instructional strategies, (3) learning activities or tasks (what the learners will do) and how these activities support meaningful learning, (4) the learning technologies that will enable learners to accomplish these tasks, and (5) assessment criteria.

3. A prototype of the TSCLE showing the learning activities that the learners will engage in and the supporting learning technologies.

Trustworthiness

To enhance the credibility of study procedures and findings, the researcher conducted several trustworthiness strategies: a thick description of the research process and findings, data triangulation, member checks, and debriefing supervisors (Glesne, 2016; Maxwell, 2013).

A full description of research procedures was presented in this Enactment Phase. A thick description, essential in qualitative research, "involves providing a detailed description of the context and circumstances surrounding the phenomena being studied." (Curtin & Fossey, 2007, p. 4). Thus, the meaning-making can be well understood. All methods used in each micro-cycle of this Enactment Phase were clearly presented in detail. Thick and rich descriptions are provided for each phase's particular setting, participants, rationale for choosing each method for data collection and data analysis, and the procedures of conducting them to obtain the intended results. In addition, thick description of the findings and raw data are provided in Chapter Four.

Using multiple methods to collect data from "a diverse range of individuals" and to report the result of this phase is considered a method of triangulation (Maxwell, 2013). The triangulation strategy used herein was for completeness purposes, as a means of generating and compiling a variety of participants' ideas and perspectives by using different data sources (a focus group, one-on-one interviews, and expert reviews). Thus, these multiple methods used to collect data from multiple participants helped capture holistic components of the formal guideline for OER integration in a college course. The inputs and concepts received were used to generate the OER intervention prototype.

In the focus group, the purpose was to elicit and generate ideas from experts and practitioners toward integrating OER as a part of the pedagogy of EDIT 730. Thus, the researcher designed social activities among participants to generate ideas and concepts that were subsequently unified in the analysis process and verified by using member checking to check the accuracy of the interpretation and enhance the credibility of the conclusion (Teddlie & Tashakkori, 2009). The one-on-one interview was used to probe participants on the ideas they raised in the focus group discussion to ensure the accuracy of the researcher's interpretation as well as to get clarification and to fill in the gaps in the obtained results. Thus, trustworthiness is provided.

Debriefing supervisors (the dissertation committee members) about feedback on the questions of the focus group and one-on-one interviews enhanced the credibility of these data sources and ensured that they were used to obtain what the researcher desired to explore (Glesne, 2016). In addition, two expert reviews were used to revise the final products of this phase and fill in any missing pieces. Thus, using this strategy provides trustworthiness for the study results in this phase.

Micro-Cycle 2: Design a Prototype of the OER Intervention

The purpose of this second micro-cycle of the Enactment Phase was to design a prototype of the OER intervention. The generated design principles for integrating OER in a college course and the detailed document that describes the strategy to support this integration to manifest in OEP were used as guidelines to inform the essential components of the intervention design. The selected course (Advanced Instructional Design) was redesigned as a means of infusing the principles of OER usage and creation into the course curriculum, particularly in the instructions of the

main assignments. This integration procedure was undertaken through iterative cycles of refinements to approach the ultimate goal of this study, moving toward OEP.

Participants. The participants of this second micro-cycle in the Enactment Phase were the researcher of this study, the instructor of the course (who is the director of the Learning Technologies Division at the research university), and the librarian staff member described above in the first micro-cycle who supported building and providing the OER intervention's design components, the results of which are discussed in Chapter Four.

Data sources and instruments. The data sources and instruments used in the second micro-cycle were: artifact analysis and designer reflection. The artifact analysis aimed to analyze the structure of the EDIT 730 in LMS Bb before embedding the OER intervention in the course curriculum. This artifact analysis was identified as structure (1) of the EDIT 730 to distinguish from the artifact analysis of structure (2) of the EDIT 730 because it will be repeated during the implementation of the intervention. The designer reflection was carried out by the researcher of this study to record the changes and modifications that were made to the original structure of the course after embedding the OER intervention in the course curriculum and before the Implementation Phase.

Procedure. The artifact analysis was conducted before embedding the OER intervention prototype in the course, to provide a visual map of the original structure of the course prior to infusing any changes to its curriculum. This visual map is presented in Chapter Four. Regarding designer reflection, the researcher reflected on the concepts and ideas that were raised through the data collection in the first micro-cycle (Appendix I). As mentioned earlier, EDIT 730 was used as a medium for

designing the OER intervention. The course is delivered through the LMS Bb platform. The researcher and the instructor of EDIT 730 worked together to embed the intervention components in the course site in Blackboard, based on the detailed document generated in the first micro-cycle. Meetings occurred for two weeks to adjust the instructions related to OER usage and creation throughout the syllabus of the course as well as in the instructions of the main assignments. All instructions were embedded under each assignment section, attempting to make the instructions direct and clear to students. In addition, open access articles were added to reading materials under the related module. Furthermore, there were frequent communications with the librarians regarding building and providing the required resources. These communications occurred in physical meetings at the site as well as through Skype and email prior to the start of the Fall semester, in order to ensure the readiness of the course design with OER intervention.

Data analysis. After analysis of the designer's reflections, data analysis continued with analysis of the artifact. The technique used for analyzing the artifact, structure (1) of EDIT 730, was mapping the structure of the course in the LMS Bb by developing an alignment grid of reading requirements and related learning activities week by week, as well as creating an alignment grid of learning outcomes, learning experiences, learning activities, and reading resources. These alignment grids helped to capture and track the changes that have been made to the original course structure after embodying the OER intervention in the syllabus, which is discussed in Chapter Four.

In addition, designer reflection is considered a critical data source for data analysis. McKenney and Reeves (2012) argued that "reflection encompasses active

and thoughtful consideration of what has come together in both research and development with the aim of producing new understanding" (p. 151). Designer reflection is identical to researcher journals and blogs to explore the process of investigating the phenomenon (Saldana, 2016). Thus, the designer reflection in this study occurred after analyzing the artifact and before designing the intervention in Bb in order to capture if changes have been made to the course design as a consequent of shifting from OER to OEP. The analytical technique of designer reflection was used for contextualizing in a form of narrative analysis (Maxwell, 1997) by reading the reflection line by line (Glesne, 2016). This narrative analysis allowed for emerging new concepts and ideas and later informed the Local Impact Evaluation Phase.

In the end, the concepts emerging from the designer reflection were compiled and displayed in a concept map that is presented in Chapter Four. Maxwell (2013) pointed out that the purposes of using concept mapping are to develop a theory, help make connections among the components of the design, and determine the gaps or ambiguous parts in the design. Thus, concept mapping enables the researcher to figure out a way to fill any gaps and examine it in the next Local Impact Evaluation Phase. Table 5 outlines the main process of shifting from OER to OEP, including data sources and instruments used for each micro-cycle in this Enactment Phase, which began with developing the design principles for OER integration in the course and ended with designing a plan for course-enabled OER usage and creation.

Table 5

The Main Process, Data Sources, and Instruments Used and Produced in Each Micro-Cycle in the Enactment Phase

Micro-cycles	Data Source and Instruments Guiding the Intervention Design	Final Product
Micro-Cycle 1: Generating design principles and intervention's components	- Syllabus of EDIT 730 - Visual course mapping template - Backward design model - Matrix of pedagogical models and learning architecture based on the degree of openness - Inputs and results of the pilot study - Initial theoretical conjectures - Focus groups - One-on-one interview - Expert reviews	A guideline including OER design principles and a detailed document of OER intervention's components based on the syllabus of EDIT 730
Micro-Cycle 2: Designing OER intervention Prototype	Designer reflection ● Artifact analysis	- Design OER intervention on LMS Bb - Concept mapping of the process of shifting from OER to OEP - Course structure (1) on LMS Bb before designing the intervention

Phase Three: Local Impact Evaluation Phase

The Local Impact Evaluation Phase, the "evaluation and reflection phase" according to McKenney and Reeves (2012), promotes formative evaluation, further testing of the implementation of the prototype intervention of OER, and refining the

generated design principles. Moreover, it informs the development of a theoretical understanding of the enacted learning phenomenon. Thus, this Evaluation Phase aimed to examine from different perspectives the effectiveness of the design principles that manifested in designing the OER intervention in the EDIT 730 curriculum. Specifically, this evaluation sought to: (a) examine to what extent the OER intervention enhanced students' awareness of OER and associated concepts; (b) explore the perceptions of students regarding the benefits and drawbacks of the OER intervention in supporting their learning and opening teaching and learning practices; (c) explore the instructor's perception regarding the effectiveness of the OER intervention in the course and the pedagogical models that might contribute to advance the usage and creation of OER; and (d) determine if there is evidence of a shift in the pedagogy of the course. This is the overarching research question guiding this phase:

Research Question Two. How are the OER design principles operationalized and implemented in a college course?

Three sub-questions were investigated:

A. What are the perceptions of students regarding the benefits and drawbacks of these principles in supporting their learning?

B. What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course?

C. Is there evidence of a shift in the pedagogy of the course?

It is important to note that originally there were only two sub-questions: (A) What are the perceptions of students regarding the benefits of these principles in supporting their learning? and (B) Is there evidence of a shift in pedagogy by the instructor?

However, a change occurred during the development of the instruments of this phase. It was imperative to explore the benefits and drawbacks of OER intervention based on the students' perspectives. Thus, both the benefits and the drawbacks were questioned. In addition, it was originally proposed to direct the original second question ("Is there evidence of a shift in pedagogy by the instructor?") to the instructor, but the evidence of a change in the pedagogy of the course is much more evident through analyzing the artifact. Thus, it was critical to explore the instructor's perceptions of the effectiveness of embedding the OER intervention in the course design. As a result, an additional question ("What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course?") was created.

Intervention setting. The research setting was EDIT 730: Advanced Instructional Design, which was described above in the Enactment Phase. It is a course of 16 weeks implemented in the Fall semester between August 27 and December 10, 2019. As discussed previously, the focus of the intervention was to integrate the concept of OER usage and creation, including the 5R practices, into the instructions of the main assignments of the course. The main assignments of the course are designed to empower students to practice what they learn either individually or in groups. The first assignment is a group project where students select an example of a constructivist learning environment (CLE) and describe to what extent this example best represents the characteristics of constructivism. The second assignment is for individuals. Each student selects a constructivist-based pedagogical model (e.g., cognitive apprenticeship, community of practice), or an instructional strategy (e.g., collaboration, articulation, scaffolding), or a problem type (e.g., strategy problem, decision-making problem, design problem, dilemma) and writes a

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brief research paper about the selection. The third assignment is an individual or

group project: students develop a proposal for designing a Technology Supported

Constructivist Learning Environment (TSCLE) prototype. Students' assignments are

assessed using rubrics. In regard to OER integration, a section of OER intervention

was created in the course LMS Bb, as shown in Figure 14. Students in this section

were provided a collective of knowledge, information, and instructions in relation to

reusing and producing OER, alongside the instructions related to the 5R practices. In

addition, links to specific information were embedded in the instructions of each

assignment to ensure that students got the required information to complete the

intended tasks.
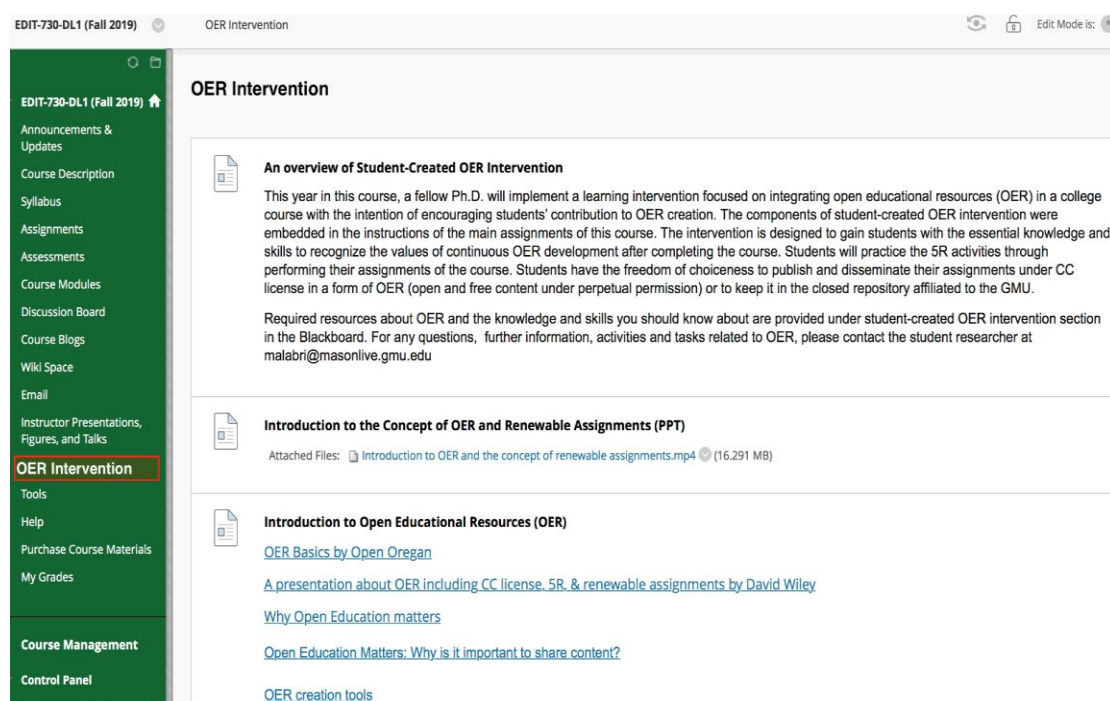
Figure 14. Creating a section for OER intervention prototype in LMS Bb

Recruitment of participants. The target population of this phase of implementation and evaluation was the Instructional Design and Technology (IDT) master's students enrolled in the Advanced Instructional Design course as well as the course instructor. The sample for this phase is purposively a convenience sample because easy access to the participants was available through the instructor of the course. According to Teddlie and Tashakkori (2009), purposive sampling can occur before and during data collection. The criteria for purposive sampling techniques used for this phase is to achieve representativeness that represents a particular type of cases on the topic under investigation, "typical case sampling" (Teddlie & Tashakkori, 2009, p.175). The only criteria for participants' selection was their enrollment in and completion of the course. The participant students were the eight graduate students who enrolled in the course in Fall semester.

Demographic of participant students. Of these eight participants, three (37%) were male and five (62%) were female. The majority of participants (62%) had professional work experience of more than 10 years, and 87% were part-time students. The participants had a variety of work experiences: instructional designer, consultant, training instructor, instructional coach for world languages, specialist in human resource development, and administrative assistant. Table 6 shows the demographic information of the participants of this phase, obtained from the pre-course survey that is discussed in Chapter Four.

Table 6

Basic Demographic of Participants from the Pre-Course Survey

Pseudonym	Gender	Work Experience	Current job	Student Status
John	Male	9-10 years	Consultant	Part-time
Tom	Male	More than 10 years	Training instructor	Part-time
Tony	Male	More than 10 years	Administrative assistant	Part-time
Naz	Female	More than 10 years	Human Resource Development Specialist	Part-time
Mariam	Female	5-6 years	Instructional designer	Part-time
Noran	Female	More than 10 years	Instructional designer	Part-time
Zohi	Female	More than 10 years	Instructional Coach for World Languages	Part-time
Alsa	Female	5-6 years	Instructional designer	Full-time

The course instructor. The involvement of the course instructor in this phase regarding the implementation and evaluation of the OER intervention was limited to directing students toward the activities that were infused in the instructions of the main assignments and prompting them to respond and cooperate with the researcher of the study. The communications with students in relation to their fulfillment to publish and share their assignments under a CC license was limited to communication between students and the researcher, to avoid the instructor's potential influence on students and to overcome the validity threats of bias and reactivity (Maxwell, 2013).

Study design. The method used in this Evaluation Phase was an exploratory case study, relying on a mixed-method (MM) design, as illustrated in Figure 15. This design combines quantitative and qualitative research methods in a single study, leading to an integrated exploration and explanation of results to construct the overall findings and inferences of the study (Teddlie & Tashakkori, 2009). These multiple methods were conducted sequentially: QUAN → QUAL indicates a quantitative-driven study followed by a qualitative study (Morse, 2003). These were the data sources used: pre-post course survey, focus group, interviews, and artifact analysis (structure 2).
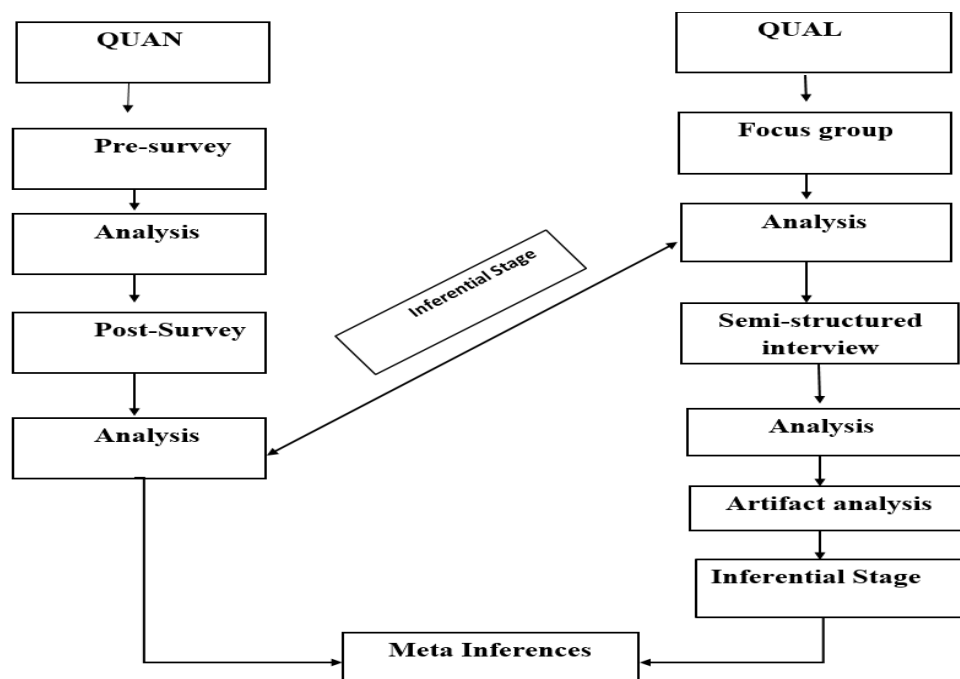
Figure 15. Graphic illustrated the two strands of sequential mixed-method research design.

Sequential mixed design. This MM design occurred in sequences in which at least two strands were conducted chronologically. Teddlie and Tashakkori (2009) argued that the sequential mixed design allows researchers to answer the research questions in a determined sequence where the results of one strand inform the formulation of the following strand. In addition, Greene, Caracelli, and Graham (1989) described the purpose of -using the result of one method to develop or inform the other method- for MM design is for development. The pre-survey was used to gather demographic information about the participants' students and explore their awareness of OER. Thus, in this study, the results of the focus group informed the formulation of the post-course survey questionnaire, and the results of both the post-course survey and the focus group informed the formulation of the interview questions. Table 7 elaborates this development process across data sources. The final

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conclusion and inferences were reported based on integration of the results from both strands. According to Greene et al. (1989), this proposed sequential MM design is used for the purposes of complementarity, seeking "elaboration, enhancement, illustration, clarification of the results from one method with the results from the other method" (p. 259). This MM design is particularly useful in answering the research questions and gradually gaining an in-depth understanding of integrating OER into EDIT 730, as the evaluation of this phase moved forward. In other words, this MM design contributes to comprehending different interpretations from different perspectives, and it also supports responding to plausible validity threats to the inferences of the study with justification from more than one strand as a means of triangulation, which is one of the fundamental values of using multiple methods in a single study (Greene et al., 1989; Maxwell, 2013).

Specifically, the sequential mixed-method design used in this phase encompasses: (1) a quantitative method (QUAN) involving a pre-course survey and a post-course survey to gather students' awareness of OER and their perceptions about the effectiveness of the intervention integrating OER into the curriculum of the course; and (2) a qualitative method (QUAL) involving a focus group discussion, an intensive interview, and artifact analysis to explore and understand students' and the instructor's experiences of embedding OER in OEP in EDIT 730, and to capture if a shift has been made to pedagogy of the course. Further details on the sequence of each of these methods throughout the study is discussed next. Figure 15 above illustrates the sequential MM design.

Table 7

Results Used From One Instrument to Develop the Data Collection Protocol for Next Instruments in Sequential Mixed Methods

Results from Focus Group with Students	Development of Questionnaires for Post-Course Survey with students
Results obtained from ***the Focus group*** informed the development of the some questionnaires for the ***post-course survey*** In the focus group, the perceived concept of OER renewable assignments among students was a great idea and promise. Thus, questionnaires were created to ask students if they decided to share their assignments under CC license, which OER databased they selected, and which assignments they shared.	Q1. I decided to share my assignments executed in this course online under a CC license. - Yes - No Q2. If your response to the previous question was yes, a. Please specify what type of CC license did you select for your work? - Public Domain - CC-BY - CC-BY-SA - CC-BY-NC - CC-BY-NC-SA b. Please specify where you shared your work (e.g., MERLOT, OER Commons)………………………… C. Please, specify the assignments you shared in MERLOT or/and in OER Commons?...

In focus group, students' feedback about the effectiveness of the main assignments in enhancing their learning was that they are lacking for connections among knowledge and between the assignments and learning activities within the course. Thus, questionnaires were created to validate their perceived points of views and gain additional clarification	Q. Do you feel there is a continuum of knowledge across the main assignments (CLE presentation, research brief, final project (TSCLE)) and learning activities (posting reflection in discussion forums and WordPress) of this course? • Strongly agree • Agree • Neutral • Disagree • Strongly disagree Comments you want to add………………
In focus group, students were encouraged to thread among assignments, however, they indicated that they missed this part in the instruction. Since the focus group discussion took place before students begin working on their final project, questions were created in post-course survey if they applied this concept at the end of the course in the final project.	Q. Did you use any components of previous assignment in this class or any components of assignments in previous classes within the IDT program to execute the final project (TSCLE) for this course (EDIT730)? • Yes • No Q. If your response was "Yes", please explain…………………………………
Results from Focus Group and Post-Course Survey Based Students Perspectives	Development of the Interview Questions with the Instructor

The results obtained from both the *focus group* and the **post-course survey** informed the development of the *interview* questions.

Students' perceptions of the concept of threading across assignments, continuum of knowledge across the main assignments within the course and across the IDT program, students' application of building the final project by using previous assignments in other courses in the program to build on them, and students' feedback regarding sharing resources online under CC license led to creating questions for the interview for the instructor.

Q. Based on students' feedback about the concept of building an assignment from another assignment, they mentioned that they missed this part in the instructions embedded in the main assignments, how would you remedy this missing piece in future classes?

Q. Students' feedback about the continuum of knowledge across the main assignments was that the assignments could have been sequenced better, do you think you can change the instructions of some of these assignments to empower students to build their work across assignments?

Q. Based on students' feedback about the concept of threading across assignments is to apply it across classes for the entire IDT program, how would you explain to what extent this recommendation can be accomplished?

- What's your thought about students' use of projects they had done in other courses (e.g., EDIT 704 & 705) to build the final project for this course (EDIT 730)?

Q. Students' feedback showed that sharing and reusing OER content would be more practical with teaching aspects such as reusing lesson plans to build upon them or to repurpose them, but not for students' course assignments. To what extent do you agree or disagree?

Data sources and research instruments. The data sources used in the Local Impact Evaluation Phase were the OER renewable assignments for previous students that had been uploaded in MERLOT, pre-post course survey, focus group, interview, and artifact analysis. It is essential to have a collection of CC assignments prior to implementing the usage and creation of OER in a course. These CC assignments acted as a base for current students to practice the 5Rs instead of using them as merely models of best practices. In addition, two strands of MM design were used to gather data in this phase (Figure 15). Strand (1) included instruments of the pre-course survey, focus group discussion, and post-course survey that were used to collect data from the students. Strand (2) included two data sources: a semi-structured interview that was used to collect data from the course instructor, and an artifact analysis that was used to analyze structure 2 of the course to look for evidence of a change in the pedagogy of the course. Table 8 shows the alignment of the research questions with the data sources and gathering intended data.

It is important to highlight the modifications that occurred in determining the instruments used in the formative evaluation for this phase. The initial data source was to conduct a one-on-one interview with each student. However, during the implementation of the OER intervention, it was replaced with a focus group discussion. That is, students had to do many things related to the content of the course and they did not actually get deeper into the OER intervention. Their engagement was limited to executing the instructions embedded in the main assignments. This method, the focus group, is particularly useful for gaining an in-depth understanding of the effectiveness of an OER intervention from multiple perspectives, based on the social

interactions among students in the discussion session (Johnson & Christensen, 2014).

These instruments of data collection are discussed next in sequence.

     Pre-course survey. The pre-course survey sought to measure students'

awareness of the concept of OER and its components before exposure to the

intervention (second research question A). Specifically, it aimed to gather general

information about the participants and to determine their prior knowledge about OER

and the associated copyright licenses, as well as to determine what information about

OER and copyright licenses that the participants want to learn. Survey research is "a

non-experimental research method in which questionnaires are used to gather

Information and the goal is to understand the characteristics of a population based on

the sample data" (Johnson & Christensen, 2014, p. 249).

     The pre-course survey was developed and administered online through Survey

Monkey. It was administered to students in week 3 of the semester. Eight questions of

the pre-course survey were included from the pilot study's survey that was conducted

in the Informed Exploration Phase and discussed in this chapter. The researcher added

ten more questions to the pre-course survey. In the end, there was a total of 18

questions divided into four parts (appendix K): (1) demographic information

including gender, length of work experience, job title, and the student's status in the

program at the university; (2) the term "open educational resources" aimed to explore

the level of students' awareness of the term *OER* and the 5R practices; (3) copyright

and open licensing aimed to explore students' knowledge about different types of

copyrights including CC licenses, fair use, and university ownership copyright; and

(4) OER repositories aimed to explore students' awareness of searching for and

locating OER materials. Open-ended questions were involved under each part to

gather additional information and knowledge about OER and interrelated concepts. The intention was to provide any additional information required by students under the OER intervention section in Bb to support them in executing their assignments in terms of practicing the 5R, producing OER, and sharing OER.

Focus group. The focus group discussion was chosen to gather qualitative data (Appendix L) in this phase concerning students' perspectives on the effectiveness of the generated design principles and OER intervention in supporting students' learning and opening the practices of teaching and learning in the course (second research question A). Johnson and Christensen (2014) pointed out that the major advantage of the focus group is to gain an in-depth understanding of how a certain group of individuals think and perceive the topic under examination. In addition, the collaborative nature of the focus group offers another advantage that is useful in evaluation research (e.g., as an implementation of a design or a product): it is an opportunity for participants to share multiple perspectives. Thus, to capture the participants' constructed views, the focus group was audio recorded. According to Krueger and Casey (2000), the best number of participants in a focus group is from 5 to 10 who share similar characteristics (homogeneous), in order to promote discussion. In this phase, all eight participants, who were exposed to similar kinds of activities and experiences throughout the course, joined and participated in the discussion that lasted for 38 minutes.

In a focus group, the researchers ask a group of people questions one at a time in a predetermined context for a specific purpose (Glesne, 2016). Distinctively, the focus group discussion was intended to (a) capture the students' perceptions of the concept of OER renewable assignments as a means of providing student contributions

to OER creation, (b) explore students' perceptions regarding the benefits of the main assignments of the course and the impact of infusing the 5Rs practices into the instructions in enhancing the students' learning, (c) understand students' perception of the idea of threading across assignments and to what extent they employed it throughout their assignments in this class, (d) deduce new pedagogical models that can advance the implementation of OER intervention in the course with future students, including the integration of the 5R and creation of OER into courses. The focus group discussion took place at the end of the semester in week 12, where students were starting to work on their final projects. From a constructivist stance, it was an ideal decision to replace the interview with the focus group discussion; students in a group discussing their experiences regarding the impact of the design principles and the OER intervention prototype on their learning and educational practices of the course stimulated different perspectives, convergent and divergent, and new ideas for refining not only the design principles and OER intervention, but also for refining the curriculum of the course.

Post-course survey. The post-course survey was developed to obtain further information on the perceptions of students regarding the benefits and drawbacks of the generated design principles in supporting their learning (second research question A). It was developed and administered to students online via Survey Monkey at the completion of the course in week 16. The survey is a self-report data collection; it is used to emphasize individuals' "verbal information", but it is not used to measure participants' behavior (Yin, 2018). The results extracted from the focus group data, especially the discourse focused on discussing the idea of threading across assignments, informed the design of the questions on this post-course survey (Table

7). Particularly, the questions in this post-course survey aimed to (1) examine to what extent the OER intervention contributed to increase the awareness of OER and interrelated concepts among students, (2) explore to what extent the intervention manifested in opening the practices of teaching and learning in the main assignments of this course, and (3) explore to what extent the design of the OER intervention made it easy to follow the planned instructions and activities related to the integration of OER usage and creation (along with 5R practices) into the main assignments of this course

The post-course survey was composed of closed-ended and open-ended questions. The questionnaires were built from 22 items (Appendix M) distributed into three parts: (1) The benefits and drawbacks of the OER intervention in increasing students' awareness of OER and associated concepts such as CC licenses and the 5R practices, (2) the usefulness of the OER intervention in opening teaching and learning practices in EDIT 730 that aimed to generate students' impression about the components infused in the intervention (e.g., critiquing a CLE presentation example in MERLOT and using the components of previous assignments to build the next assignment), and (3) the usability of the OER intervention that aimed to measure to what extent the instructions used to direct students toward performing the assignments and activities related to OER usage and creation were easy to use. The researcher interrelated images with some items to remind students about what they had learned and executed during the entire course while they responded to the survey questionnaires. Almost all items on the questionnaires were written in a positive attitude; only one item was written in negative. Examples of items written in positive are "I learned about the different types of Creative Commons (CC) licenses and

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selecting the appropriate license for my work." and "I learned about the different OER databases in my related discipline." For instance, if a student's response was "yes", this was considered a positive attitude. The item written in negative was "Did you face any difficulties in using the feature -add a comment- in MERLOT to critique the selected CLE presentations of previous students?" For example, if a student's response was "yes", this was considered a negative attitude.

Semi-structured interview. A semi-structured interview was chosen to gather qualitative data from the instructor (Appendix N) as a result of integrating the OER intervention in the course she taught. The face-to-face interview took place after completion of the course; it lasted for one hour, and it was audiotaped. An interview is a non-directive and general approach that helps the researcher to gain an in-depth understanding of the instructor's constructed views on the potential affordances of OER in innovating pedagogy practices in college courses (Teddlie & Tashakkori, 2009). Particularly, the interview was intended to (a) examine the effectiveness of the OER intervention based on the instructor's perceptions, and (b) explore the pedagogical models that might contribute to advance the usage and creation of OER in a college course (second research question B). The results from the post-course survey and the focus group informed the design for the interview questions (Table 7). For example, regarding instructions that guided students to build one assignment from previous assignments, students' feedback was used to formulate the questions for interviewing the instructor to locate the areas of improvement in the OER intervention for future classes.

Artifact analysis (structure 2). In this phase, the artifact analysis took place after designing and embedding the OER intervention in the course LMS Bb. The

primary purpose of this artifact analysis was to capture and compare the changes that have been made to structure 1 after integrating OER and the 5Rs into the course's syllabus. Particularly, it aimed to capture if a change or a shift existed to the pedagogy of the course and to the instructions of the main assignments that were used to engage students in practicing the 5Rs (second research question C).

Table 8

Research Questions and Data Sources Guiding the Local Impact Evaluation Phase

Research Question	Data Sources and Instruments	Purpose
Q2. How are the OER design principles operationalized and implemented in a college course?	• Pre- and post-course surveys • Focus group • Interview • Artifact Analysis	
a. What are the perceptions of students regarding the benefits and drawbacks of these principles in supporting their learning?	• Pre-course survey	• Determine students' awareness of the concept of OER and associated attributes.
	• Focus group	• Examine the effectiveness of the generated OER design principles and OER intervention in supporting students' learning and opening the practices of teaching and learning in the course.
	• Post-course survey	• Examine to what extent the OER intervention contributed to increase the awareness of OER and related concepts among students.

		● Explore to what extent the intervention manifested in opening the practices of teaching and learning in the main assignments of this course, from the students' perspectives.
		● Explore students' perceptions to what extent the design of the OER intervention made it easy to follow the planned instructions and activities related to the integration of OER and 5R practices in the main assignments of the course.
B. What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course?	● Interview	● Examine the effectiveness of the OER intervention in the course design based on the instructor's perceptions.
		● Explore pedagogical models that might contribute to advance the usage and creation of OER in college courses.
C. Is there evidence of a shift in the pedagogy of the course?	● Artifact analysis	● Capture if a shift existed to the pedagogy of the course, and to the instructions of the main assignments that were used to engage students in OER usage and creation.

Procedure. At the beginning of the semester (August 28), the instructor of the course introduced the researcher to the class as a doctoral student testing an OER intervention. In addition, the instructor introduced the OER intervention to students along with the course syllabus and encouraged them to explore the resources under the intervention section in Bb (Figure 16). Since the selected course was mostly delivered online, a narrated presentation (Figure 16) was uploaded under the intervention section in Bb. The narrated presentation introduced students to the term OER and interrelated concepts; it also introduced the concept of renewable assignments and students' engagement in OER usage and creation. In addition, examples of best practices of using OER beyond accessibility were presented. Furthermore, examples of CC assignments in MERLOT for students in previous classes were shown.

Figure 16. An introductory narrated presentation about OER and the intervention uploaded in LMS Bb

Because the OER intervention was embedded in the course curriculum, the instructions in relation to OER usage and creation as well as the 5R practices were infused in the instructions of the main assignments. Thus, students practiced the components of the intervention alongside the course assignments. To recruit the students, the students were approached by the instructor informing them about the purpose of the OER intervention. To begin this process of evaluation, the researcher invited the participants via email early in the semester (week 3) to respond to the pre-course survey online via Survey Monkey. Results from this pre-course survey (Figure 17) helped determine students' awareness of OER and associated components, and the results also indicated areas in which the students were interested in further information.
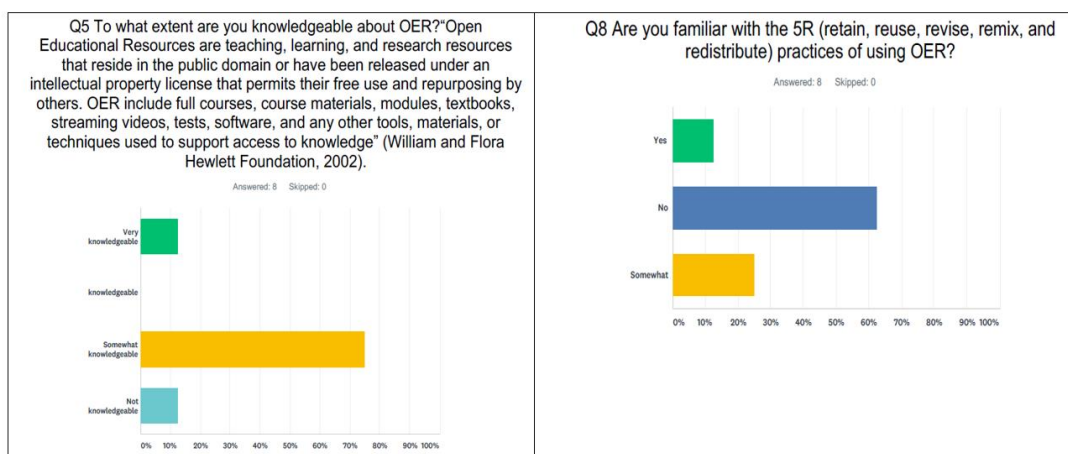
Figure 17: A snapshot of students' responses to the pre-course survey regarding their awareness of OER and related concepts

Throughout the implementation of the OER intervention, the researcher observed students' engagement in and execution of instructions related to the

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intervention via LMS Bb. Consequently, according to the communication between the instructor and the researcher, the researcher followed up students' completion of related activities. In addition, the researcher engaged in grading students' activities such as commenting in MERLOT. In terms of encouraging students to share their assignments under a CC license, the researcher approached students via email after each assignment was completed and graded by the instructor, asking if they wanted to make their assignments OER and upload them to OER databases. To direct students for publishing OER renewable assignments, the researcher provided students detailed instructions that guided them to the process of attributing their work under a CC license and sharing them online in MERLOT and/or in OER Commons. For students who decided to publish their assignments in MERLOT, the researcher requested they send her the link of the published assignments in MERLOT, to add it to the webpage of the collection of CC assignments for this particular course. For students who wanted to publish in OER Commons, the researcher created a group called *Advanced Instructional Design*. Thus, students joined the group and uploaded their CC assignments. An example of these detailed instructions is presented in Figure 18.

Hello Tom,

First of all, thank you for completing the online survey.

If you decided to share you final project under CC license, you can upload it in MERLOT or OER Commons or other OER database. The instructions are as follows.

- Access Blackboard and download the components of the final project. You can combine it in any way do you prefer.
- Select the type of CC license in which you want others/ future students in this class to use your work. To learn more about different types of CC license, explore resources under student-created OER intervention (An Overview of Copyright and Creative Commons Licenses)
- To create CC license for your final project, you can access (https://creativecommons.org/choose/), follow the instruction to select the type of CC license for your work. Your selected CC license will be created automatically in the website. Copy the license and past it in your documents. The second option to create your CC license is to add CC add-in to the Microsoft office so, you can create your CC in the Word & PowerPoint presentation itself.
- After you created the CC license for your document, access MERLOT OR OER Commons) to upload your assignments.
  o To upload your assignment in MERLOT, you need to upload it in OneDrive or any other places where users can access to view and reuse it. Log in to MERLOT, select (add a material to MERLOT), and follow the instructions to submit it in MERLOT database. Also, you can explore resources under student-created OER intervention (How to use MERLOT: "How to add materials to MERLOT").
  o To upload it in OER Commons, join the Advanced Instructional Design group in OER Commons and upload your assignment in this group. When you uploaded, it will appear pending for approval from the OER Commons administrator. It will take couples of days to be published in the database (no further actions are required).
- After you completed publishing your assignments in any CC database, please, send me the URL of your publication to add them to the webpage of all CC assignments.

If you have any questions, clarification or need further information, please let me know.

Thank you for your cooperation.

Figure 18. An example of the instructions the researcher emailed when inviting participant students to share their assignments under CC licenses

Later, in week 12, to explore students' perceptions based on their experiences in executing the activities related to the OER intervention, the researcher invited students via email to a focus group discussion and sent them the consent form for confirming their participation. The focus group took place in the last 40 minutes of a face-to face class. An open discussion (open-ended questions) was used to extrapolate participants' perceptions about the effectiveness of the generated OER design principles and the OER intervention in supporting students' learning and opening the

practices of teaching and learning in the course. This discussion included exploring students' perceptions of the concept of renewable assignments and the idea of threading across assignments. In addition, the discussion sought to generate ideas for improving the performance of the main assignments and learning activities of this course and thus to improve the OER intervention. The discussion was audio recorded to fully capture the students' experiences. The data was transcribed and analyzed immediately; the results of the data analysis informed the next data collection method, the post-course survey.

The post-course survey, developed based on the results obtained from the focus group data, was administered in week 16, near the end of the course. It was administered to students mainly to obtain further understanding of their perceptions regarding the benefits and drawbacks of the OER intervention. Open-ended questions were used to avoid missing data that might remain undiscovered through closed-ended questions. To understand and link the results of this post-course survey to the results obtained from the focus group based on students' perspectives, the data from the post-course survey was analyzed immediately after all students' responses. Both of these results informed the formulation of the interview questions for the instructor.

As a result, after the course completion, the researcher approached the instructor of the course via email and arranged a time to conduct a semi-structured interview. The Interview with the instructor sought to explore the effectiveness of the design principles of integrating OER into the course curriculum and to explore a new trend for pedagogical models that might contribute to advance OER usage and creation in college courses. The interview was audio recorded. Finally, an artifact analysis was conducted to see if a change had been made to the original structure of

the course after embedding the OER intervention in the curriculum. The results of the data analysis are discussed in Chapter Four.

Protecting human subjects: Privacy and confidentiality. Ethical approval for conducting this dissertation study was obtained from the Institutional Review Board (IRB) at the researcher's university prior to all data collection procedures (Appendix J). Pursuant to IRB approval, any information shared through this study must be kept strictly confidential. In this study, the only identifiable information was collected from the participants on the pre-course survey: data related to their gender, job title, work experiences, and current status in the program. Any identifiable information obtained from the focus group discussion is kept strictly confidential, accessed only by the researcher, and used only for research purposes. Pseudonyms were used to present the results of the data collected, to avoid any identifiable information (Maxwell, 2013).

The raw data are stored on the researcher's computer with password protection for 5 years, at which time the data will be destroyed. The instructor did not see who among the students agreed to participate in publishing and sharing their own work online under a Creative Commons license until after grades had been posted. That was to prevent potential undue influence on students. In this study, students' participation was voluntary, and turning their assignments into OER content was optional. The direct benefit for students' participation in this study was clearly explained on the consent form. There is no benefit for students except that they get a publication credit by sharing own work online under a Creative Commons license.

Reliability and trustworthiness. The criteria for the trustworthiness of a study are principally related to the "research methods, techniques for data collection,

analysis, and interpretation." (Glesne, 2016, p. 54). In this dissertation study, the researcher took the steps to provide a study with quality and rigor by applying several trustworthiness strategies: detailed documentation of the research procedures, rich and thick description, member checking, negative cases, triangulation or using multiple methods for data collection and analysis, debriefing the supervisor (the chair committees), and peer review (Glesne, 2016; Lincoln & Guba, 1985; Maxwell, 2013; Yin, 2018).

The method used to carry out this dissertation study is mainly design-based research that featured an iterative process of research procedures. Using design-based research promotes recording and documenting the research procedures in detail and contributes to producing a study with rigor and quality (McKenney & Reeves, 2012). Accordingly, the researcher inherently provided explicit documentation for different aspects of the research procedures, including thorough an iterative process of data collection, data analysis, and interpretation. Each cycle in design-based research is considered a piece of an independent research study as regards to its iterative characteristics to optimize the design or the prototype to meet the desired goals (Plomp, 2007). Consequently, all the documentation included in this study contributes to addressing ethical concerns pertaining to biases and uncertainty of the conclusion and elevates the quality of the meta-inferences of the dissertation study.

The focus group discussion was applied with the participant students in the formative Local Impact Evaluation Phase. Using focus groups in a study provides a degree of "external validity" based on the fact that focus groups are given in a communication event where a small group of individuals discuss ideas and issues in groups (Albrecht, Johnson, & Walther, 1993, p. 4). Thus, the individuals' opinions

and thoughts were generated in a social context rather than a personal context. In this focus group, the researcher moderated the communication with the participant students to understand one's own perceptions, seek further explanations, and explore new ideas for future improvement of the intervention as well as the components of the course. "A focus group responding to a new product, concept, or idea might generate opinions more like those of the public than would even a large number of isolated respondents." (Albrecht, Johnson, & Walther, 1993, p. 4). To avoid own bias, the researcher was cautioned to be open for negative and positive opinions about the components implemented in the intervention. Besides, all participants' experience was documented in the analysis process (including the negative cases) and verified through member checking, to ensure the credibility and accuracy of the researcher's interpretation of the participants' perspectives. To mitigate the influence of one participant's opinions on others, throughout the focus group discussion, the researcher asserted to the participants the importance of providing their own experiences and to be honest for the purpose of improving the intervention and the components of the course. Thick and rich descriptions about the data collection and analysis as well as the procedure were presented in this chapter. Thick descriptions of the results and interpretation were provided in Chapter Four.

The triangulation of methods (QUAL and QUAN) and data sources (surveys, a focus group, and an interview) permits the researcher to verify the realities of the effectiveness of the OER intervention on students' learning as well as on making an innovation to the pedagogy of the course based on variations of the participants' representations of their own perceptions about the phenomenon. Yin (2018) asserted that the considerable strength of case study data collection is to use various sources of

evidence for the same phenomenon to develop "converging lines of inquiry" (p. 127).

The results in the study were obtained from different sources of evidence that

occurred sequentially. The results of one source were used to follow up the inquiry

from the next source. Results of this sort featured with multiplism enhance the

validity of the derived inferences and the conclusion of the study, and it is "likely to

be more convincing and accurate." (Glesne, 2016; Maxwell, 2013; Teddlie &

Tashakkori, 2009; Yin, 2018, p. 128). The meta-inferences are discussed in Chapter

Five.

Debriefing and obtaining external input and feedback from supervisors and

peers about the design of the study, including data collection, analysis, and research

procedures ensure the appropriateness of predetermined methodology and enhance the

quality and reliability of the focus group, interviews, and questionnaires that were

used to obtain the data of this study (Glesne, 2016; Teddlie & Tashakkori, 2009).

To ensure the measurement validity of a survey's questionnaires, the

researchers need to judge if the predefined data collection instruments actually

measure what they desire to evaluate in the underlying study. Teddlie and Tashakkori

(2009) asserted that "This type of [determining measurement validity] judgmental

validation is typically useful only if your instruments intend to measure a *specific* and

well-defined attribute." (p. 210). Consequently, since the pre-course survey's

questionnaire included eight questions from the pilot study's questionnaire, the

reliability of the pre-course survey was established previously. In addition, the

researcher used debriefing of supervisors to provide feedback on the questionnaires of

both the pre- and post-course surveys. Besides, the researcher approached peers and

experts to provide input and feedback to ensure the validity of the survey's items, and

it assesses the effectiveness of the OER intervention in terms of its benefits and drawbacks, usefulness, and usability. To do so, after the online survey was created on the web, the researcher approached current graduate students, alumni, professors, and faculty from different universities for testing the content validity and construct validity. Based on the received feedback, the online survey was modified and administered to the participants for collecting real data.

Researcher's role. Determining the researcher's role in a study requires the researcher to position oneself to the participants to easily fit in and be welcomed (Glesne, 2016). First of all, while renewable assignments are an emergent concept in the OER movement, the researcher is skeptical about its effectiveness in teaching and learning practices and aware about people's concerns to donating their own assignments/works in public to be used by others without charge. Therefore, the researcher was being open to other possibilities obtained from the participants. The researcher's intention was to learn from the students' and instructor's perspectives about the concept of integrating OER in the curriculum of the course. Based on the participants' experiences, the researcher constructed understanding and provided evidence-based practice to the controversial topic in the body of knowledge in OER movement, which is the potential of OER in making a change or an innovation in the pedagogy of a college course.

In addition, to situate the researcher's position in testing the OER intervention in the selected course, a narrated presentation was given to the class at the beginning of the semester explaining the concept of OER and renewable assignments and the purpose of the study. Moreover, the researcher attended a few face-to-face classes with the participants to establish a rapport with them and make them feel comfortable.

The researcher sent several emails to ask participants after each completed assignment if they wish to publish their own work under a CC license. To make this activity easy for them, the researcher devoted an email to provide detailed instructions to direct students on the process of turning assignments into OER and sharing them online in OER databases.

The researcher's role in the focus group was as a moderator and facilitator of the discussion. "The group moderator needs to get everyone involved in discussing the researcher's questions and not allow one or two people to dominate the discussion" (Johnson & Kristensen, 2014, p. 235). The researcher attempted to keep the individuals focused on the topic being discussed and encouraged all participants to engage in presenting and showing their feelings and thoughts. In addition, the researcher tried to extract and generate new ideas for improving the intervention and the overall instructional performance of the course. She used open-ended questions and probed for additional information and further explanations of ideas to ultimately understand the benefits and drawbacks of the OER intervention (Creswell & David Creswell, 2018).

In addition, the researcher was a teaching assistant for the course for three semesters (Spring 2018, Fall 2019, and Spring 2019) and contributed to the course design, collaborating with the instructor of the course; that work included locating resource materials (OER or traditional resources related to the content of the course) and building a database for all assignments for previous classes within the course site. Moreover, the researcher with the instructor engaged in a communication with the university's library and publications staff for building a digital repository particularly for this course, as described in Chapter Four. Furthermore, the researcher's role was

as a researcher-observer to tackle participant students in performing activities that were related to the 5R and OER usage and creation (e.g., the researcher sent emails to some participants who missed critiquing a CC CLE presentation example in MERLOT). Besides, the researcher contributed to grade participants' activities in relation to the OER intervention.

Data analysis. This section discusses the analysis process for mixed methods data obtained (1) from quantitative data sources using pre- and post-course surveys, and (2) from qualitative data sources using a focus group discussion, semi-structured interview, and artifact analysis of structure 2 for EDIT 730 in Bb. The significant value of a mixed method design's data analysis resides in the process of integrating, combining, and connecting inferences that are made on the basis of qualitative and quantitative research findings (Teddlie & Tashakkori, 2009). The quantitative data manifest specific relationships in the phenomenon under investigation, whereas the qualitative data offer explanations for that relationship (Yin, 2018). Making inferences is a process that is etic (researchers' construction of the relationships and connections among participants' responses) and emic (researchers' interpretation and explanation from participants' perspectives). To make inferences in a study, researchers must keep the research questions and research purposes in front of them during the analysis and interpretation process (Maxwell, 2013; Teddlie & Tashakkori, 2009). The main reason for using MM in this study was to gain a better understanding and exploration of the phenomenon under examination. The researcher believes that qualitative and quantitative methods must be integrated in the data collection, analysis, and reporting the findings of studies so that they mutually illuminate the conclusion (Bryman, 2006).

There are different typologies of MM data analysis techniques; the researcher's proposal for this Evaluation Phase was to adopt sequential mixed data analysis (Teddlie & Tashakkori, 2009). This technique uses descriptive statistics for analyzing QUAN data and thematic analysis for QUAL data independently, as discussed in Chapter Four (Burke, Johnson, & Christensen, 2014). This typology of data analysis offers an effective way to understand the phenomenon under investigation due to the advantages of integrating the findings into "meta-inferences" (as shown in Figure 15) (Teddlie & Tashakkori, 2009, p. 266). In the following section, the researcher summarized the analysis techniques for the quantitative and qualitative data sources in sequence (based on the order they were conducted in this study) and then described the techniques used to merge findings from both QUAN and QUAL to end in reporting the meta-inferences that are discussed in Chapter Five.

Sequential mixed-methods analysis. In general, to analyze data, the researcher always revisited research questions to ensure the alignment of the data set to the research purposes (Maxwell, 2013). Descriptive analysis is the first step in the data analysis process that provides a holistic background of the participants (McCarthy, McCarthy, Ceccucci, & Halawi, 2019). Thus, at first, descriptive statistics were used to analyze the data of the pre-course survey. The pre-course survey included closed-ended questions and open-ended questions in which these data were gathered and analyzed simultaneously. All data were downloaded from the Survey Monkey website using the export options to save the summary report into PDF and Excel spreadsheet formats. The raw data of the pre-course survey did not show any identifiable information about the participants beyond the information explained in this chapter. The personal data were identified from the job titles that were shared by students

through engaging in a bibliography activity in the discussion forum at the beginning of the course. The participants' pseudonyms were created and added manually to the table of participants' personnel data that was presented in this chapter under the demographics of participants. Overall, the results gleaned from the pre-course survey spotlighted the level of participants' awareness of the concept of OER and associated attributes and determined the information required to raise their awareness of the concepts behind OER use. Participants' responses to the pre-course survey indicated their interest to learn about the university ownership copyright. As a result, it was planned to invite an expert from the university publishing group, which was involved in the development of the intervention, as a guest speaker to explain on this subject. However, it was disappointing to learn that the expert has left the university.

Then, the data gathered from the focus group discussion with the participant students was analyzed. Inductive open coding techniques were used (Glesne, 2016; Maxwell, 2013). MAXQDA analysis software was used to analyze the data. There is no single correct strategy for analyzing qualitative data (Maxwell, 2013). It is well-known that inductive analysis carries out the generation of results from specific to general (Hatch, 2002). Therefore, the first step in analyzing the focus group data was transcribing the script from the audiotape recording. After the completion of the transcribing process, the next step was to read and listen to the script many times; thus, the researcher verified the transcription and became familiar with the data (Maxwell, 2013). While reading and listening, the researcher generated initial and tentative codes about categories. The next step was to use line-by-line coding by dividing the data into concepts and broad descriptions and coding it with more details. This technique helped the researcher to understand the constructed views from

participants and further explanation about new ideas the participants raised during the discussion. In this stage, a group of codes was created (Glesne, 2016; Maxwell, 2013). The researcher attempted to sort and compile under broader categories similar codes that have a pattern of relationships. Hence, substantive categories were developed that are descriptive as a means of representing "emic" categories underlying the participants' own words toward their concepts and beliefs (Maxwell, 2013). The process of creating substantive categories was iterative and recurring; change usually happened to ensure the explicit interpretation of participants' perspectives that is discussed in Chapter Four. These substantive categories articulated the participants' perceived views about the concept of OER renewable assignments, the usefulness of the main assignments, the idea of threading across assignments, and the 5Rs practices in enhancing their learning about the core academic content of the course. In addition, these categories expounded the participants' suggestions about the new ideas for improvement purposes discussed in Chapter Four.

Finally, the substantive categories were grouped and unified under larger categories to create broader concepts of the results of the study. Then, the organizational categories were developed; they are described by Maxwell (2013) as the broad issues or areas related to the topic under investigation that were established prior to the data collection process, and they are beneficial for ordering and organizing the results of the study. As aforementioned, the researcher kept going back and forth between the data and the research questions and purposes, to guarantee that the research questions were addressed from the gathered data. The results of the data analysis were discussed and illustrated with participants' quotes in Chapter Four. Fundamentally, to ensure the accuracy of interpretation based on the participants'

words, the raw data was reviewed several times while writing the results in Chapter Four. In addition, an abstract of the major findings from the focus group discussion was sent to the participants for their confirmation and for them to report any misinterpretation. Moreover, sending an abstract summary of the results to the participants is considered a validity strategy called member check (Maxwell, 2013).

Later, the data collected from the post-course survey were analyzed using descriptive statistics to evaluate the effectiveness of OER intervention from the students' perspectives. The open-ended questions and closed-ended questions were analyzed simultaneously. The data were exported from the Survey Monkey website in a form of summary report and responses data in both PDF and Excel spreadsheet formats. That is, the response data enabled the researcher to observe how the respondents answered the survey questionnaires and the summary report was easy to read and readily presented the results in charts and graphs. The analyzed data led to the emergence of new ideas and offered an opportunity for further refinements and improvements in the components and instructions of the OER intervention. A detailed deliberation of these ideas is discussed in Chapter Four.

Subsequently, the data collected from the interview with the instructor of the course was analyzed. As mentioned above, the processes of qualitative data analysis are inductive and iterative; generating patterns and themes moves from particular to general by "organizing the data into increasingly more abstract units of information" (Creswell & David Creswell, 2018, p. 181). Thus, the researcher transcribed the interview's audio recording script and converted it to text. The interview questions were not asked in the same sequence as in the interview protocol. Asking the predefined questions depended on the interviewee's responses. Then, the researcher

analyzed the interview script in MAXQDA. Iterative listening and reading had occurred to verify the transcription. Initial codes were developed. Then, line-by-line open coding was used to develop substantive categories regarding the instructor's perceived views of incorporating the usage and creation of OER and the 5R practices in the curriculum of the course. After reviewing the data several times and refining the substantive categories, the organizational categories were developed to organize the results of the interview data. Revisiting the raw data never ended. It was reviewed during interpretation of the results in Chapter Four to avoid misinterpretation and misunderstanding of the interviewee's concepts. The interview results were presented with including instantiations and quotes from the interviewee's own words to validate the interpretation. In addition, an abstract result was sent to the instructor for validating the interpretation. The artifact analysis of the course' structure (2) after embodying the OER intervention was analyzed. This analysis took place throughout the implementation of the OER intervention. In addition, this analysis was undergoing update throughout the semester. That is, the instructor raised several ideas during the implementation process. These results are presented in Chapter Four.

Meta-inferences report. The important concept in MM is to bring QUAN and QUAL components into a conversation or debate that ultimately reaches the findings and inferences of a study (Bryman, 2006). As indicated previously, the meta-inferences of this dissertation study will be established by merging the major findings from the two strands. The first strand is the major findings based on students' perspectives; the second strand is the major findings based on the instructor's perspectives and the analysis of the artifact as depicted in Figure 15. Teddlie and Tashakkori (2009) described this method of analysis integration as descriptive,

exploratory, and explanatory. They underlined that the inference process should begin at the early stages of doing a study, from the idea to data to results seeking a meaning-making "by connecting the dots" between the derived data (p. 287). These derived data included the convergent and divergent perspectives to make the inferences credible. In fact, the strength of this MM research lies in the richness of qualitative data in exploring participants' perceptions and new concepts of integrating OER as a part of the course pedagogy, and the power of quantitative data in regulating the relationship between the effectiveness of the generated design principles, the benefits and drawbacks of the OER intervention on students' learning, and the potential innovation in pedagogy practices of the course.

To report the meta-inferences of this study, the researcher began to write the report of this study by merging the qualitative and quantitative major findings from the pre- and post-course survey and the focus group, followed by combining the major findings from the interview and the artifact analysis. This complementary method provides a high degree of precision in answering the question of how these design principles were operationalized to improve teaching and learning practices in the selected course. A credible interpretation must be consistent and compatible with different types of data. Greene et al. (1989) observed that MM offers opportunities for new interpretations and new horizons related to OER integration in courses. The researcher synthesized and summarized the findings from both quantitative and qualitative results using narrative description in the conclusion section that will be discussed in Chapter Five.

Chapter Summary

In summary, Chapter Three provides an overview of the Informed Exploration Phase that was conducted as a pre-dissertation phase to investigate and gain an in-depth understanding of the debate around controversial topics in the OER movement. As a result, the problem statement was defined and the initial theoretical conjectures were developed. Accordingly, these takeaways guided the development of the design principles for OER integration in a college course in the next phases. In addition, this chapter discussed the magnitude part of the Dissertation Phase, the Enactment Phase, and the Local Impact Evaluation Phase. There were two research questions guiding these phases. The Enactment Phase led to the development of the design principles for integrating OER usage and creation in EDIT 730 and design of the OER intervention prototype. The Local Impact Evaluation Phase evaluated the implementation of the OER intervention among students and the instructor of the course. This formative evaluation assessed how these OER design principles were operationalized and implemented in a college course from the students' and instructor's perspectives. The results of both the Enactment Phase and the Local Impact Evaluation Phase will be discussed next in Chapter Four, based on the two research questions.

Chapter Four

The present study sought to design an open educational resources (OER) intervention in a college course. This design-based research (DBR) study aimed to: (a) generate design principles that support the integration of OER usage and creation into a college course in ways that manifest in open educational practices (OEP), (b) design an integrative OER intervention prototype, and (c) evaluate the effectiveness of the generated design principles and intervention prototype in the course from different perspectives. This chapter presents findings that support the research questions of the Enactment Phase and the Local Impact Evaluation Phase of DBR based on the methods outlined in Chapter Three.

The reporting of the results in this chapter is organized by phases, as well as each phase's research questions, because of the nature of educational design research—in which the results of each phase feed the development of the next phase. Thus, this chapter presents the results of the Enactment Phase, generated by analyzing data from Micro-Cycle 1 (focus group session, one-on-one interviews, and OER expert reviews) and Micro-Cycle 2 (artifact analysis and designer reflection). They are followed by the results of the Local Impact Evaluation Phase, generated by analyzing the data from the pre-post survey, the focus group, the semi-structured interview, and the artifact analysis.

As previously discussed, the purpose of this phase was development and design. Particularly, it aimed at generating design principles to aid in the design of an OER intervention to advance OER use from mere access to open content, to creating, remixing, revising, and distributing OER content, to promoting OEP. Specifically, this phase sought to answer the following research question:

Research Question One: What are the design principles that support the integration of open educational resources (OER) in a college course?

A. What instructional materials and learning strategies will be used to direct students toward OER use and creation?

B. How can the 5Rs be integrated in a college course to support students' usage and creation of OER?

Micro-Cycle 1: OER Design Principles and Intervention's Components

First Research Question: The Design Principles That Support the Integration of OER in a College Course

This section discusses the data results that support the first research question guiding this phase of the study. The initial design principles were developed based on state-of-the-art-knowledge, including principles found in empirical studies during the Informed Exploration Phase (see Appendix O). Later, they were refined based on results obtained from the focus group session, one-on-one interviews, and experts' input. These developed design principles could be described as design assumptions or hypotheses that

have yet to be tested and verified through the implementation of the intervention (Euler, 2017). Based on Euler (2017), this stage of the developmental process identified the essential elements to be included in the development of the OER intervention and determined the aspects to be evaluated through the implementation process. Furthermore, Van Den Akker et al. (2007) described these assumptions or theoretical conjectures as the core design principles for the intended design. The external experts' review was conducted in a form of design critique based on the experts' experiences in leading and engaging in several OER initiatives. The data obtained from the analysis of the written documents provided constructive comments from the experts' perspectives for refining the detailed design document including the OER design principles. Several minor changes in the design principles were suggested. As one expert wrote:

> Instead[,] for OEP to occur, OER should become the central focus of the
> pedagogy of the course perhaps. For OEP to occur, OER should be a part of the
> pedagogy of the course. There are many different aspects of pedagogy and OEP,
> and I'm not sure that it's fair to demand that OER be the central focus.

In addition, the experts endorsed designing the OER intervention based on learner-centered pedagogy using the constructivist approach to teaching; however, one expert suggested rephrasing this related principle. Another expert stated that the value of using OER in designing this course should be embedded in the design principles. As one expert explained, "Why are people going for OER and not something else? Values that underpin the design would surely influence the design principles." These expert's comments further support the ideas interpreted from the data analyzed from the focus group and

interviews. It was suggested that helping students learn about the concepts behind OER, CC licenses, and the 5Rs practices should be the ultimate goal of engaging them in using, revising, critiquing, remixing, and creating OER content. Moreover, regarding feedback obtained about students' sharing OER content in public under a least-restricted license, one expert argued that some students may not want to publish their work, and they should not be coerced into doing so. This result is consistent with the result obtained from the focus group. All participants agreed that students need to have the freedom to decide whether to release their assignments under a CC license or keep them under the university copyright.

Moreover, in terms of the choice of the most-open license for students' work, one expert stated, "I don't believe we should be encouraging people to necessarily adopt the most-open license, regardless of contextual considerations." Similarly, the results analyzed from the focus group and interviews asserted that the intention behind the OER intervention regarding converting assignments to OER should be optional for students, since it is illegal to force students to publish and share their work under CC licenses. The participants reported that an instructor can "make [students] learn about [OER and associated concepts], but she/he can't make them apply it to their work." Likewise, when the participant experts were asked in a focus group whether students should have the opportunity to select a license for their work or the instructor should determine a definite license for all student work, the participant experts in digital publishing argued that the university has established ownership copyright that grants students a copyright for their work/assignments. The participants underlined that publishing personal work under a CC

license must be optional. It cannot be mandated, forcing students to apply the least-restricted license to their assignments. Thus, in the current case of OER integration into Advanced Instructional Design, the participants indicated that the assignments are students' intellectual property, and students have the right to attach CC licenses to their assignments beyond the license that the university already has. As a result, the focus group data suggested that the instructor should encourage students to apply one of the less-restricted CC licenses, but ultimately, students' desires must be respected.

Encouraging students to become co-producers of OER leads to recalling the conversation among OER advocates in relation to the principles of OEP and open pedagogy. These principles promote having students practice the 5Rs in reusing existing OER or creating new OER, and the principles also promote encouraging students to choose the least-restricted license to grant others use of the published OER. This means that if the revised, remixed, and new OER were shared under the most-restricted CC license, both instructors and future students would have limited permission to reuse this open content. Together, these feedback provide important insights for refining the design principles. These results suggest that the core design principles that evolved from this study can be grouped into two main categories:

1. Integrating OER in learning contexts:

    a. To aid the shift to OEP, OER interventions should be based on a learner-centered pedagogical model using the principles from the constructivist approach to teaching and learning.

b. OER interventions should develop greater opportunities for both students and faculty to become competent in using digital repositories for searching and repurposing OER.

c. Learners should have full freedom to share OER materials in public under the CC license and keep them in a repository within the organization.

d. OER interventions should boost OER engagement by considering accessibility, ease of use, and flexibility for repurposing and sharing, as well as by providing OER content that is relevant to subject areas, competitive with traditional textbooks, and peer-reviewed.

2. Promoting OEP in learning contexts:

a. For OEP to occur, OER should be a part of the pedagogy of the course; educators need to use learner-centered pedagogical models to enhance innovation in teaching and learning to support learners' usage and creation of OER.

b. OER-enabled pedagogy promotes students' active participation in knowledge construction by prompting learners to collaborate, contribute, and connect to learning communities beyond the limits of the course, through engaging in the 5Rs practices.

These generated design principles informed the development of the research questions for the focus group discussion that was guided by the three stages of the backward design model (shown in Appendix F). This cycle of generating design principles provided input to the next stage: developing a detailed document that describes the components of the intervention based on the EDIT 730 syllabus.

Research Question 1A. The Instructional Materials and Learning Strategies Used to Direct Students Toward OER Use and Creation

This section discusses the data results that support addressing research question 1A. The data sources used to address this research question included a focus group, one-on-one interviews, and expert reviews that aimed to develop the components of the OER intervention. The data gleaned from the focus group session and one-on-one interviews guided the development of the components of the intervention; the development was based on the syllabus of the Advanced Instructional Design course and integrating OER as part of its pedagogy practices. Designing EDIT 730 with OER integration was guided by the three stages of the backward design model (Figure 19):

 (a) Identify the desired results that include established goals and learning outcomes.

(b) Determine acceptable evidence that includes the development of assessment methods and criteria for the quality assurance of OER renewable assignments.

(c) Plan learning experiences that include situating the current pedagogy of the course and restructuring the instructions of the main assignments toward OER use and creation.

Feedback from the OER expert reviews was used to refine the components of the intervention, as discussed in this chapter. A final detailed document of the intervention development components was discussed with the instructor for final refinement and approval.

Backward Design
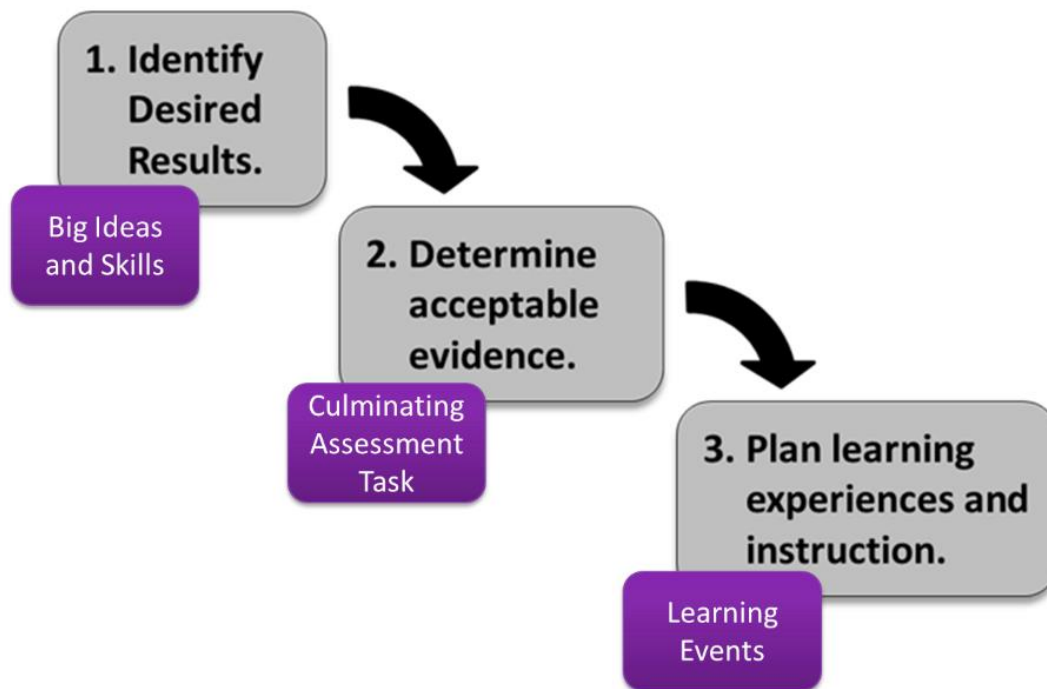
Figure 19. Backward design model developed by Wiggins, & McTighe (2005).

Identify desired results. In the backward design model, the first process in designing or redesigning a course is to establish the goals and determine the learning outcomes students will achieve by the end of the course. The intended goals for students to acquire at the end of EDIT 730, in terms of OER integration, is to repurpose and create OER content through practicing the 5Rs in executing the main assignments of the course. The goal of integrating an OER intervention into EDIT 730 requires determining the knowledge students should have and the skills they should acquire by the end of the course to empower students to transfer their understanding to different settings.

To determine the knowledge students should have by the end of the course, the first step is to define the e*nduring understanding*, which is described as the big idea, core process, and important knowledge students should understand and be able to transfer on their own to other settings after they complete the intervention (Sample, 2011; Wiggins & McTighe, 2005). The enduring understanding for students in this study is to go beyond usage of OER and become co-producers of OER through the repurposing and creation of open content. These are the big ideas that emerged from the analysis of the participants' input: (a) understanding of OER and copyright information, including the ideas behind OER and the different types of CC licenses; (b) understanding the university ownership copyright to elevate students' awareness of the differences among the types of copyright regulations; (c) identifying OER repositories, with the aim of educating students about the existing OER databases to become proficient in locating OER relevant to intended subject areas; and (d) understanding the 5Rs practices of retaining, revising, remixing, reusing, and redistributing existing OER content, in addition to creating entirely new OER.

Regarding skills beyond accessing OER that students should have as a result of integrating OER into the course, four predominant skills were identified: (a) use, produce, publish, and share OER, with the goal of creating OER content by sharing and publishing students' renewable assignments online under CC licenses, (b) practice the 5Rs by repurposing (revising, remixing, and critiquing) existing OER, breaking it into component parts and reusing the parts that meet the desired needs; (c) differentiate

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between CC licenses, to empower students to permit others to reuse their work; and (d) build on existing data.

In the external expert reviews, one expert reported that the knowledge related to the learning outcomes of the OER integration into the course syllabus was on the lower end of Bloom's cognitive outcomes, and the skills were "mainly technical skills." It was recommended to include the intellectual skills related to OER adoption. As a result, based on the experts' feedback, the item *building on existing knowledge* was added to the skills section (as mentioned above) to refer to building resources upon one another.

A common view among the participants in the focus group and interviews was that the learning outcomes related to integrating OER into the course should be identified along with the original learning outcomes of the course. That is, it is important for students to understand the outcomes they intend to accomplish at the end of the course so that "they can see where they [are] headed. The other part is that the materials they create will be turned into OER." As a result, two main objectives emerged from the analysis of the focus group and interviews: understand the concepts behind OER, and appreciate the creation of OER. However, after multiple rounds of review with the instructor, it was suggested to combine the learning outcomes from integrating OER into one objective: Appreciate the usefulness of OER in the teaching and learning process. Table 9 shows the OER intervention goals and skills.

Table 9

Established Goals of Enduring Understanding, Skills, and Meaning Making of the Big

Ideas

Stage 1: Identify Desired Results

Learning Outcomes:
- Appreciate the value and usefulness of OER in the teaching and learning process

Enduring Understanding*:*	Skills (*Students will be able to):*
• Understanding OER and copyright information • Understanding the university ownership copyright • Identifying OER repositories • Understanding the 5Rs process	• Using, producing, publishing, and sharing OER • Editing (remixing, critiquing, and revising) OER content • Differentiating between CC licenses • Building on existing knowledge

Determine acceptable evidence. The next stage of the backward design model is

to discuss the assessment methods in relation to OER usage and creation. When asked

about developing criteria to assess students' understanding of OER, CC licenses, and the

5Rs practices, participants indicated that it would be necessary to add details or

prescribed items to rubrics to help students achieve the desired results and encourage

them to apply the least-restricted CC license to their work. Ideas about the development

of criteria were confined to having students produce a product that could be used later. In

other words, did the students create a completely self-contained product that has

everything known, with nothing new to add? By thinking in this way, it was suggested

the criteria should be included to identify the next steps other users could take with the

same product in terms of refinement and improvement. A number of participants saw this

criterion as similar to doing research because it involved identifying what is known and indicating that additional research would be helpful to follow up on this knowledge to improve it. One interviewee stated, "I think that might be a way of assessing. It is extending the learning experiences a little bit." Furthermore, one of the participants endorsed this idea further and described it as a good pedagogical practice because students would be asked to anticipate and think about the strengths and weaknesses in the topic under study. In contrast, the instructor of the course had a different view, arguing that she used to give students comments to improve and fix the deficiencies in their assignments, thus, it would be difficult to ask them to anticipate the next improvement for their assignments.

Integrating OER and 5Rs into the EDIT 730 course syllabus focused on restructuring the three main assignments of the course. Thus, to assess students' understanding of OER and the 5Rs in assignment A (the CLE presentation), the current students were asked to find an example of a CLE and critique it based on the five principles of constructivism. Concerns were expressed by the instructor of the course about assignment A. The instructor stated, "This would be a sort of add-on [that would] make the assignment bigger." Students do the original exercise and also look at previous CC CLE examples in MERLOT and critique them. Thus, the assignment will take longer to complete. One participant who has expertise in teaching and learning commented that "adding just to critique the assignments, that's not a major kind of [add on]." In addition, there was a consensus among participants about the critiquing activity in that it will offer value to students' experiences of the 5Rs practices. That is, if it was optional, students

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would not do it, but if it was required, "I guess they will [buy in] it." Based on the diverse

views among participants and the instructor, it was suggested to add criteria for

assignment A. It was proposed to reduce the point value of the original activities in

assignment A from 25 points to 20, and use the other 5 points for the critique practice.

Another suggestion was to re-weight the three assignments to 30, 20, and 25 points,

respectively, by pulling the 5 points from another assignment. Consequently, the

instructor of the course suggested leaving the instructor evaluation valued at 20 points

and replacing the peer evaluation, valued at 5 points, by developing new criteria related

to critiquing the CLE examples in MERLOT. Consequently, the criterion, *reviewing the*

CLE example in MERLOT, was added, and its value was 5 points. It was distributed into

different activities as follows: create an account in the MERLOT OER database, access

the CLE page in MERLOT, select one example of the CLE presentation, provide

comments in the comments section by using *add a comment*, and your comments should

be based on the CLE principles and criteria identified in the CLE example presentation.

A snapshot of this added criterion is shown in Figure 20. For assignment B, the

instruction, *Use open access articles*, was added, but it is not measurable. No assessment

criterion was added to assignment C.

CLE Evaluation Criteria 25 points

CLE Presentation (4)

- Adequacy and quality of presentation materials in supporting the presentation (were the presentation materials effective in articulating the group's understanding of the requirements, e.g., use of visuals, animations, etc.)
- Organization of presentation (includes staying within timeframe, covering what you plan to cover, clarity, effectiveness, design of presentation)
- Evidence of teamwork (presentation should indicate that partners have collaborated on every aspect of its preparation and delivery)

CLE Presentation Content (16)

- **(4)** CLE principles and characteristics are clearly identified, grounded in the readings, epistemology table, and additional reliable resources (**citation of references in APA expected**)
- **(4)** Contrasting CLE and OLE principles and instructional characteristics is based on their theoretical grounding and instructional implications and clearly articulated using examples or research evidence
- **(4)** CLE example clearly aligns with the principles and instructional characteristics of constructivism or related theory (e.g., connectivism, distributed cognition) as identified above; the CLE demonstrates an applied example of constructivism; the design of the CLE is explained
- **(4)** How well did the selected example embody the principles of constructivism? Were the learning technologies used to implement the CLE appropriate? Critique the design and the use of technology in facilitating the implementation of the CLE

Reviewing CLE Example in MERLOT (5)

- Create an account in the MERLOT OER database
- Access the CLE page in MERLOT
- Select one example of the CLE presentation
- Provide comments in the comments section by using "add a comment"
- Your comments should be based on the CLE principles and criteria identified in the CLE example presentation

Figure 20. A snapshot of assessing students in critiquing the assignment in MERLOT from LMS Bb

In addition, a criteria list was developed to evaluate the OER renewable assignments if students decided to publish them online under a CC license (Appendix P). These criteria were adapted from different criteria available from the library service at Austin Community College, Affordable Learning Georgia, and a faculty guide for evaluating OER at the BC campus (Austin Community College, 2018a, 2018b; BC Campus, 2015). The criteria list has four norms:

(a) accuracy refers to the precision of the content, the flow of information, the

language of writing, and if it is free of typographical and grammatical errors;

(b) production quality refers to the clarity of the content, the ease of navigating

the product interface, and the quality of the embedded audio and video;

(c) accessibility refers to the content/products being provided in a format
accessible without restrictions, the readability of text and images, and the
provision of transcripts or subtitles for video and audio resources; and

(d) flexibility and licensing refer to the flexibility of adapting the content in terms
of the format used for OER production and the type of license selected to
grant others permission to modify, revise, and remix the open content.

These criteria were supposed to be used by the researcher to evaluate the quality of OER
renewable assignments for current students' assignments in this course. However,
because only two students published their assignments, these criteria were neither used
nor analyzed in this study. Three groups responded to the researcher's email regarding
their desire to publish their assignments, but they reported after they addressed the
instructor's comments. One student reported via email, "I am definitely interested but,
based on [the instructor]'s input, I wanted to make a few edits before posting it. I will let
you know when I am ready to post it!" In addition, as one participant replied to the email,

Thank you so much for your email. Naz and I discussed [it], and we'd like to
assist with the OER project. However, we want to upload our best work. In this
case, we wouldn't be comfortable doing so unless we were able to address the
professor's final comments on the presentation, and time constraints are currently
an issue. Can we revisit what projects from this course to upload as OER at the
end of the semester?

Plan learning experiences and instructions. The next stage of the backward
design model is to plan the learning experiences and instructions. Planning the learning

experiences consisted of restructuring the instructions of the main assignments, then

defining resources and technology to support students in executing the activities that are

related to OER use and creation. However, prior to planning the learning experiences for

the main assignments, it was necessary to situate the current pedagogy model used for

teaching this course—EDIT 730—and envision the change that might occur to support

the integration of OER and the 5Rs practices into the course assignments.

The instructor of EDIT 730 was asked to reflect on the current pedagogy used as a

method for teaching the course. The instructor characterized the current pedagogy as a

very learner-centered, semi-constructivist approach. The instructor used a variety of

activities, collaborative and individual, to support students to achieve the learning

outcomes of the course. In addition, the instructor promoted active engagement in

learning through activities in the classroom and self-directed learning outside the

classroom using dialogue and discussion activities (e.g., responding to the course

readings and sharing their takeaways with peers in the discussion forum and WordPress

blog posts). Furthermore, the instructor empowered students' ownership of their learning

by giving them the opportunity to explore topics of interest for both individual and

collaborative assignments. As the instructor stated,

> They choose their context; they choose their client in a way hypothetically
>
> because it is an advanced instructional design that [focuses] more on pedagogy
>
> and design based on the five characteristics of designing a constructivist learning
>
> environment.

The instructor highlighted that this pedagogy was not open; it was bounded by specific

learning outcomes that students needed to accomplish by the end of the course. Thus,

based on the matrix of learning architecture and OER usage developed by Ehler (2012),

the current pedagogy of EDIT 730 was analyzed as being at the medium stage: the

objectives were predetermined, but the methods of teaching and learning were slightly

open to engage learners in dialogue and collaborative activities. Similarly, the OER usage

was analyzed as being at the medium stage, which focuses only on converting students'

works to OER and not expanding to OER usage (as shown in Figure 21).

Figure 21. The pedagogy approach of the Advanced Instructional Design course based on the Matrix of learning architecture and OER usage developed by Ehlers (2011)

With respect to the learner-centered pedagogical model of the course, one

interviewee with expertise in teaching and learning explained that one of the main goals

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of the learner-centered approach is to create something that has intrinsic value rather than just a response to an assignment. The participants reported that the performance assignments and activities in this course were constructivist and learner-centered. For example, students had to give presentations to the class and respond to each other's questions, thus learning from one another, which is considered a part of the learner-centered approach. Another participant pointed out that having students create renewable assignments by building upon one another's work, revising, remixing, and sharing it in public, was itself a part of the learner-centered pedagogical model. In general, the majority of participants expressed that students in this course learned by doing something, not just absorbing what they were taught and repeating it back. Furthermore, it was reported that another main characteristic of the learner-centered approach was reallocating power and the responsibilities in the course. The instructor was less of a knowledge source; the students discovered and created knowledge for themselves. The students had the "self-sufficiency and autonomy" to pursue topics or contexts of their own interest. As one interviewee with expertise in teaching and learning explained,

> This kind of program where all [students] will become instructional designers, they do it in different stages; some of them do it in higher education, or K-12, [and] some of them in industry or commercial training, and so allowing them [to] pursue their projects in a context that makes sense to them is also a big role of learner-centered [design].

Turning now to restructuring the main assignments with integrating OER and the 5Rs practices, the discussion and activities in the focus group about restructuring the

instructions of these assignments were carried out in two groups. Interestingly, the two groups (Group 1 and Group 2) shared similar views of the technique of building resources upon one another. First, Group 1 reported that, for assignment A (the CLE presentation), students would be directed to look at the technology-supported constructivist learning environment (TSCLE) prototypes made by previous students and revise them, instead of going outside to find CLE examples. For assignment B, they suggested students look at research briefs done by previous students, especially if they wanted to use the same topic, then adjust the papers or make their own. For assignment C, they suggested students use assignment A as a starting point to develop the final TSCLE prototype.

Second, Group 2 reported that they intended to build the three assignments on top of one another, using insights gained from the early assignments to inform the later ones, with the aim of making them reusable and/or renewable. Students would start on assignment A by going out and finding their own CLE, then use that knowledge to create the research brief (assignment B) and use the research brief to create the final TSCLE prototype (assignment C). In addition, a variety of suggestions were offered for Assignment A. For example, Group 2 suggested keeping instructions (A) and (B) the same but changing instruction (C). Moreover, they had the idea of asking students to critique previous CLE examples developed by their peers and uploaded in MERLOT under the CC license. Furthermore, it was suggested that students should use the commentary features in MERLOT for enrichment, corrections, and refinement.

Nevertheless, despite all these suggestions, the instructor still wanted students to find their own CLE examples.

For restructuring assignment B, Group 2 proposed that students use the knowledge from assignment A to create a scenario for the research brief (assignment B). In addition, they contended that the research brief assignments represented studies that can be published in MERLOT or in an open journal. They also proposed creating an encyclopedia entry or using Wikipedia to share these assignments. For restructuring assignment C, they indicated that students would use information from the research brief assignment or learning design problem to design a proposal and design table for the TSCLE prototype. Furthermore, they suggested creating a closed repository in the university's library to deposit students' work, so students could come back and look at it or publish it.

Supplementing resources that support the integration of the OER intervention into courses is critical. Thus, regarding curating resources to support the learning outcomes of this course, the librarian participant offered to create an InfoGuide page especially for this course. The librarian participant described this as "curated resources that are geared toward the topic." This InfoGuide page will be built in the LMS Blackboard's EDIT 730. Thus, students can access this InfoGuide to search for relevant OER content on the topic of constructivism and connectivism. In addition, students can use this InfoGuide for performing their assignments, specifically the research brief assignment. Therefore, to do so, prior to the start of the semester, the librarian worked with the researcher and the course instructor. The librarian requested the privilege to access the course in the Bb.

Then, the librarian embedded the library content into the LMS Bb based on the course

learning objectives and syllabus. This InfoGuide included a cohesive catalog of formal

reading and open-access journals, as well as peer-reviewed journals (Figure 22). The

instructor pointed out, "I already have the articles that I want them [students] to read

every week, but I welcome the integration of open resources, but I [am] still [going] to

use the formal resources." In addition, a collection of OER resources relevant to the content

of constructivism was used as supplemental resources.

Figure 22. A snapshot of the inforguide page in the course's LMS Bb

Research Question 1B. The Integration of the 5Rs in the Course Curriculum to Support Students' Usage and Creation of OER

This section discusses the data results that support addressing research question 1B. The data sources used to address this research question included a focus group, one-on-one interviews, and expert reviews. The data from these sources guided the integration

of the 5Rs into the instructions of the main assignments and also guided defining the options for licensing students' work.

The main idea for integrating the 5Rs that emerged from the data of the focus group was threading across assignments. The idea of threading across assignments implied that the 5Rs could be operationalized by allowing students to reuse what they executed in one assignment to build the next assignment, and so forth. One participant commented, "I think that ties everything together, rather than do this and set it aside. This [is] a constructivist sort of process." For this selected course, the proposition was that the CLE presentation (assignment A)—either from previous classes or created by the student—could be remixed and reused for the research brief (assignment B) to create the potential scenario. Then, the scenario or the topic selected for the research brief or the learning design problem students shared in the discussion forum in week 6 could be remixed and reused to frame the proposal and develop the design table for the TSCLE project (assignment C). "For example, let's say this research brief is about experiential learning, and maybe take the scenario from this brief and maybe use it to design the TSCLE prototype." Similarly, the data analyzed from expert reviews asserted that, to make the assignments more renewable, students could build on and revise the existing materials on networking on the web (e.g., Wikipedia or EDUCAUSE Learning Initiative content). In addition, the external OER experts underlined that the ideal way to value OER would be to remix existing open materials for executing assignments, such as a class project, that would become a resource built over semesters. Furthermore, it was suggested to incorporate other OEP elements, such as using WordPress for sharing and

distributing renewable assignments. This result aligns with the results obtained from the focus group and interviews regarding the potential of sharing students' assignments openly in open repositories.

With respect to integrating the 5Rs in the instructions of the main assignments of the course, the instructor reported struggling with how students would perform their assignments while practicing the 5Rs: "It is difficult to integrate OER into courses. Do I have them create their own CLE at the end or do they just keep renewing other CLEs?" In the focus group and interviews, the participants insisted that integrating the 5Rs into instructions of the assignments will promote revising what other students had done and considered it much more realistic than creating brand-new content. The participants suggested that the students could critique assignments from previous classes, using the commenting feature of MERLOT. However, because MERLOT does not show the history of editing and revising the content as Wikipedia does, students could upload the revised renewable assignment as a new renewable assignment and add the word "revised" to the name, such as "SimMan revised."

What stands out in Table 10 regarding the thoughts behind the 5Rs practices are various perspectives from the participants besides building resources upon one another. These evident aspects were revising and remixing practices, supplementing and enrichment, sharing resources, and critiquing as a means of argumentation and explanations for improvement. With respect to revising and remixing, it was defined by reusing pieces of the original content to create new work similar to scholarly work. In addition, it was reported that practicing the 5Rs on OER aims to supplement and enrich

its content, similar to the activities occurring on Wikipedia. Regarding the distribution, it

was interpreted that the 5Rs practices enabled students to keep sharing revised, improved,

and remixed resources over time through a continuous process of sharing and distributing

knowledge. Finally, another aspect was critiquing OER materials as a means of

identifying areas of improvement to enhance the OER materials' quality and establish

argumentation and explanations. One interviewee's interpretation of *remixing* and

critiquing was that they were analogous in meaning. The interviewee commented that

scholarly critique was a kind of remixing, such as finding an argument or a piece of work

related to the field or topic under study, using parts of it and trying to make corrections to

them.

Table 10

Different Interpretations of the 5Rs Practices

5Rs Definitions	Participants' Interpretations
Building resources upon one another	"It is really do not matter where they [assignments] live. I just want to have these assignments and keep pushing them back to the resources to build the resources from each other."
Revising and remixing practices	"I mean when we [are] talking about remixing and reusing things, this is really what it typically mean[s], like taking pieces of [the] original, creative content, more creative than factual, the less pressure to need [a] CC license on it to do [the] kind of work that scholar[s] do."
	"But you made a [serious] point here [in the research brief]. This is not factual content; they cannot take this research brief, repackage it, and produce another research brief called 'experiential education' using that same

content."

Supplementing and enrichment	"If I have an article on Wikipedia, I am not trying to take someone's work. I will try to supplement and enrich that work and everybody involved in understanding that project."
Sharing resources	"They are building [on top] of what somebody else did and adding into it. I think that would be more encouragement to keep sharing going forward."
Critiquing as a means of establishing argumentation and explanations for improvement	"I definitely hear projects where that class or small set within a class do a kind of editorial work on when they say, like, to say this part need[s] to go there . . . this part needs to be improved. We're going to keep this part."

As shown in Figure 23, the data from participants' interpretation and meaning-making about the 5Rs practices were used to create a word cloud with EdWordle (http://www.edwordle.net).

Figure 23. Word cloud showing participants' interpretation of the 5Rs practices.
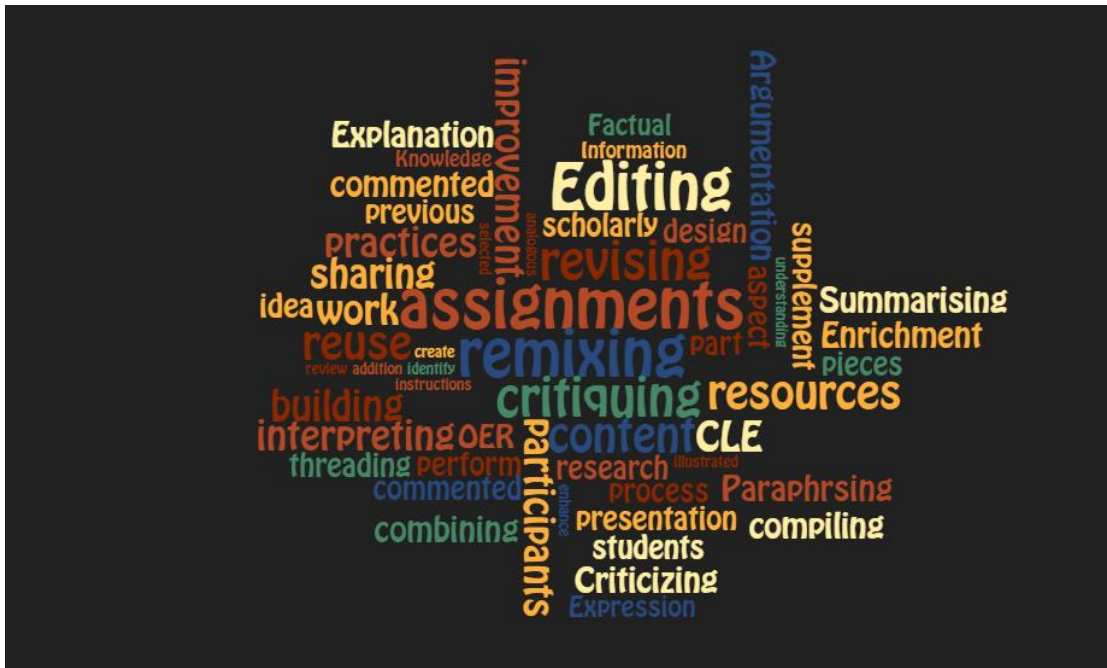
The results obtained from all data sources confirmed that publishing personal work under a CC license must be optional. Thus, if students choose not to make their work into OER content, the instructor can reuse them as an example within the course for future students. However, future students cannot repack and disseminate these non-OER assignments outside the university. As a result, it was recommended that these non-OER assignments be deposited in a closed repository within the university, to be reusable by future students in the course. Consequently, a database for hosting students' assignments in EDIT 730 was created, as shown in Figure 24.
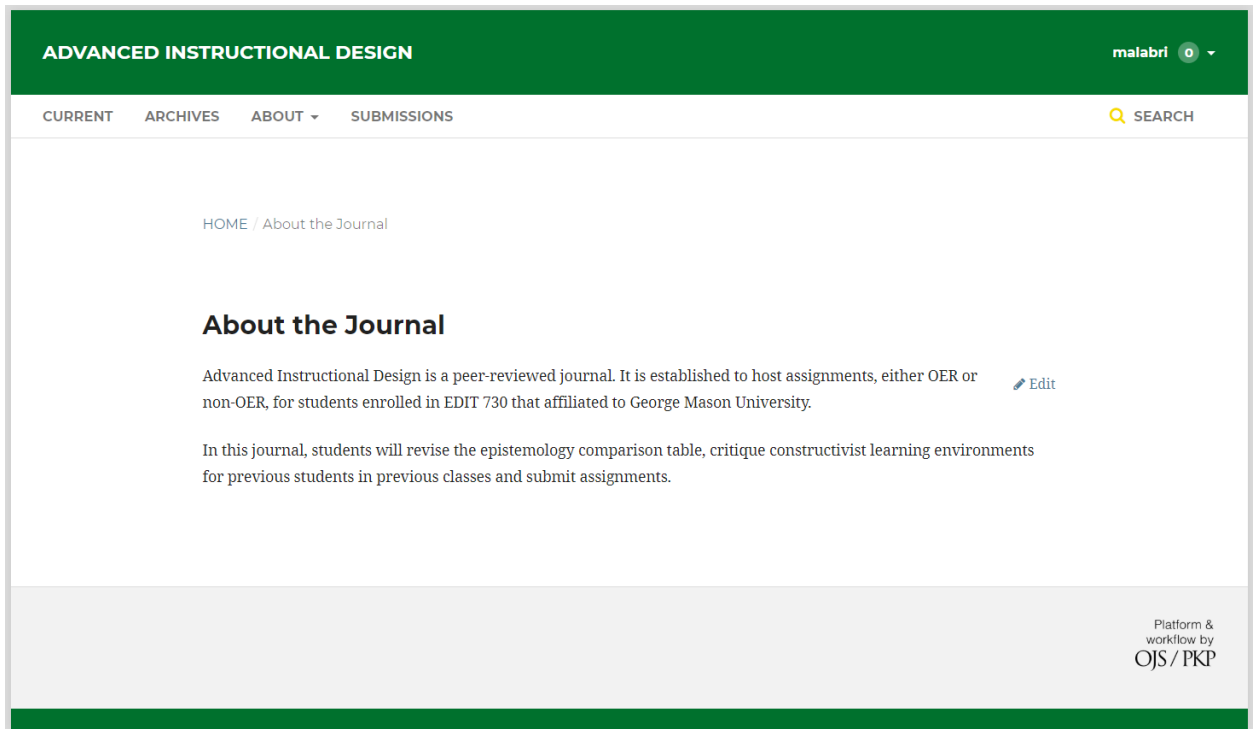
Figure 24. A snapshot of the prospective database to be created within the university to curate all students' assignments (closed and open) for EDIT 730 in one place

Talking about licensing students' work led to a question about fair use of copyrighted work. One participant who was aware of it reported that, according to U.S. copyright law, users have no copyright on facts (such as climate change), but they own the copyright to their expression of those facts if it is a creative expression, such as drawing something or making a video. In this case, the users own the copyright of that expression because they tried to explain the facts and make them intelligible to the world. Arguably, the participants' point of view focused on the use of factual information; however, the assignments for the course (in particular assignment B, the research brief) are expressions of facts that cannot be duplicated. The information in these assignments

is common knowledge within the discipline that does not belong to the students, but the reframing of this knowledge in their assignments belongs to them. Therefore, if students used factual knowledge to critique and criticize without infringing on the original copyright, it would be considered similar to common scholarly activities, which do not violate the law. However, if students created illustrations and contributed to creating a new creative model, reusing them would be considered copyright infringement.

In general, the participants reported that the CC license does not supplement or interfere with fair use. CC licenses were established to invite users on the Internet to reuse content without seeking permission. One participant explained that remixing and revising the research brief (assignment B) is similar to editing articles in Wikipedia, which aims to supplement and enrich existing work. Regarding the main assignment of this course (the research brief), participants reported that although students engage in summarizing and paraphrasing what other people have said, which is similar to the expression of factual information, it is not creative. It is identical to combining and compiling knowledge in Wikipedia, which is not considered a copyright violation. Users do not have to get permission because it is a scholarly activity, and they have the privilege to critique and comment.

In the end, based on the data obtained from Micro-Cycle 1 (focus group, one-on-one interviews, expert reviews), Table 11 illustrates the proposed activities related to restructuring the main assignment with OER integration into the instructions in terms of OER use and creation, including the integration of the 5Rs. In addition, Table 12 contains an alignment matrix integrating OER into the Advanced Instructional Design course. The

alignment matrix depicts the identified learning outcomes of the OER intervention

alongside assessment strategies and learning activities. This alignment matrix portrays

how students will learn about OER and related attributes. Having generated the design

principles for integrating OER in EDIT 730 and determining the components of the

intervention, the next section will include a discussion of the results obtained from

Micro-Cycle 2, which led to the designing and embedding of the OER intervention

prototype in the course LMS Bb.

Table 11

Restructuring the Main Assignments of EDIT 730

Plan Learning Experiences, Instructions, and 5Rs Integration	
Assignment A	Constructivist Learning Environment (CLE) Criteria and Applications
Description/ Instructions	In groups, students will perform the following: a. Identify the theoretical principles and instructional characteristics of CLEs based on the readings and additional reliable resources. b. Contrast these to the theoretical principles and instructional characteristics of objectivist or behaviorist learning environments. c. Take a look at an existing CC example of CLEs in MERLOT (Advanced Instructional Design) and critique the extent to which the selected CC CLE example embodies the principles of constructivism using the CLE assignment criteria. d. Find and share an example of a CLE that is technology supported and subscribes to the CLE principles and characteristics identified, and critique the extent to which the selected CLE example embodies the principles of

	constructivism. Did the CLE example fully embody the principles identified? Why or why not? Can it be improved upon? Was it effective as a CLE/TSLE?
	The end product for this assignment is a 15–20 min in-class presentation that describes the findings of the group with respect to these items. More detail is provided on the course website under "Assignments."
Operationalizing 5Rs/ Sharing OER Renewable Assignment	The 5Rs are operationalized through the following activities: 1. Critique the CC CLE examples for previous students in MERLOT using the "add a comment" feature. 2. Develop a closed repository at the research university's library to house all CLE examples (open or not), in which the critique can happen. Sharing and publishing the CLE assignment under a CC license is optional: Students can choose one of two options: Option A: Publish and share assignments under a CC license in MERLOT or OER Commons that can be disseminated outside the boundaries of the university. Option B: Retain their assignments in a closed repository affiliated to the university that can be used within the course.
	Students who select Option A need to understand the different types of CC licenses, select and add an appropriate CC license to the work, and upload it to MERLOT or OER Commons.
Technology	● Searching database ● Wikis ● MERLOT
Resources	● To create an InfoGuide by the library team in topics related to constructivism and connectivism and build it in the LMS Bb of the course ● MERLOT resources ● Open access journals
Assignment B	Research Brief

Description/
Instructions
	Each student will select a constructivist-based pedagogical model (e.g., cognitive apprenticeship, community of practice, situated learning, problem-based learning) OR an instructional strategy (e.g., collaboration, articulation, scaffolding, problem-solving), OR a learning technology (e.g., immersive tools, collaboration tools, knowledge representation tools) and write a research brief based on the *5 Things You Need to Know About*:
	    1. What is it?
	    2. How does it work?
	    3. Who is doing it?
	    4. How effective is it?
	    5. What are its implications for instructional design?
	Students can use the CLE examples selected for the first assignment or the learning design problem shared in the discussion forum to create a scenario for this research brief assignment.
	References should include course readings as well as new empirical research including open access articles related to the selected model, strategy, or technology. The research brief papers represent studies to be published in MERLOT or open journals.

Operationalizing 5Rs/
Sharing OER
Renewable Assignment
	This assignment is executed using:
	    ● Threading across assignments
	        ○ CLE presentation
	        ○ Research briefs in MERLOT and WordPress
	        ○ Learning design problem
	The 5Rs are operationalized using the CLE presentation executed for the first assignment (open or not) to create a scenario for the research brief assignment.
	Sharing and publishing the research brief assignment under a CC license is optional. Students can choose one of the following:
	    ● Option A: Publish the research brief in MERLOT, OER Commons, or in an open journal.
	    ● Option B: Publish the research brief by creating a Wikipedia entry.
	    ● Option C: Retain the assignments in a repository within the university that can be used within the course.

Technology	● Generate an editable encyclopedia entry

	● Wikipedia or similar
Resources	● InfoGuide in topics of this course related to constructivism and connectivism
	● Previous research briefs in MERLOT as examples
	● Dissertations, openly available literature review
	● Instructor video
Assignment C	Designing a Technology-Supported Constructivist Learning Environment (TSCLE)
Description/ Instructions	Individually or in small groups, students will select a constructivist-based pedagogical model or the meaningful learning characteristics and apply a grounded design approach (i.e., the Meaningful Online Learning Design Framework) to develop a prototype of the TSCLE for a specific target audience and learning content. The prototype will demonstrate how supportive, dialogic, and exploratory instructional strategies are implemented. Students can use the components of the research brief such as the principles and characteristics of the selected topic for the research brief to develop a design table for the TSCLE. The final deliverable for this assignment should include the following three components: 1. A proposal (design document) describing the parameters of the TSCLE, including the learning problem, target audience, learning outcomes (knowledge/skills/content), pedagogical model or meaningful learning framework, instructional strategies, learning activities, learning technologies, and assessment approach. 2. A design table depicting the grounded design of the TSCLE. The table is a blueprint or storyboard for the prototype and should illustrate the mapping or alignment of the following design elements: (a) learning outcomes, (b) instructional strategies, (c) learning activities or tasks (what the learners will do) and how these activities support meaningful learning, (d) the learning technologies that will enable learners to accomplish these tasks, and (e) assessment criteria. 3. A prototype of the TSCLE showing the learning activities that the learners will engage in and the supporting learning technologies. This prototype can be developed in PPT or a

	technology of your choice (e.g., wiki, Google Sites, Wix, WordPress, Adobe Captivate).
Operationalizing 5Rs/Sharing OER Renewable Assignment	The 5Rs are operationalized by the following activity: ● Students can consider using the learning design problem shared in the discussion forum or the real assignment of the research brief to design a proposal and design table for TSCLE. Sharing and publishing the TSCLE assignment under a CC license is optional. Students can choose one of the following: ● Option A: The components of this assignment can be published in MERLOT, OER Commons, an open journal, or any other open repository. ● Option B: Retain the assignments in a repository affiliated to the university that can be used within the course.

Table 12

Learning Outcomes/Assessment Strategies/Learning Activities Alignment Matrix for Integrating OER in EDIT 730

Learning Outcomes to Promote Students Becoming Co-producers of OER	How Learning/Understanding Will Be Assessed	Learning Activities	Resources for Supporting Students to Achieve the Learning Outcomes (to Become Co-producers of OER)
Appreciate the value and usefulness of OER in the teaching and learning process	Assignment A: In-class presentation of CLE criteria and applications (15–20 min) Students will: 1. Critique the existing CC CLE examples in MERLOT and how they embody the principles of constructivism using the CLE assignment criteria, and 2. Find an example of CLE and create their own CLE presentation.	• Use formal reading as well as OER content to complete the assignment. • Use the "add a comment" feature in MERLOT to critique the selected example of CC CLE presentation. • Build a database of CLE examples from previous courses (open or not) in Bb. • Create a closed repository to house all CLE examples (open or not) where the critique can happen at the research university library.	• A presentation about OER and associated components (concept, CC license, 5Rs practices, and potential benefits of OER and renewable assignments) • YouTube videos about OER and CC licenses • A presentation to demonstrate how 5Rs practices can be operationalized to revise and create OER content • InfoGuide to be created by the library team on topics of this course related to constructivism and connectivism

Assignment B: Develop a research brief as a scholarly publication that can be published in MERLOT or an open journal.
 	
Students will:
 	
1. Select a topic in the course content related to constructivism and connectivism to write a research brief based on the *5 Things You Need to Know About.* They will use empirical studies, including open access articles.
2. Use the learning design problem students shared in week 6 or the CLE presentation example as a "potential scenario" for the research brief.
	• Threading across assignments/building 5Rs by reusing and revising these assignments:
	  1. CLE presentations
	  2. Research briefs
	  3. Learning design problem
	• Find examples of research briefs in MERLOT.
	• Use course readings as well as new empirical research including open access resources to complete the assignment.
	• Publish the research brief in MERLOT or open journals to generate an encyclopedia entry that is editable for publishing research brief papers.
		• A video for searching and evaluating OER found online
		• A guest speaker from the library to present how to find quality OER, including open access articles and reputable publishers
		• List of OER repositories in Bb for finding and publishing OER
		• InfoGuide on topics of this course related to constructivism and connectivism
		• Previous research briefs in MERLOT
		• Literature reviews from openly available dissertations

	Assignment C: Designing a Technology-Supported Constructivist Learning Environment (TSCLE). Students can consider using the learning design problem they submitted to the discussion forum and/or the research brief components to frame the proposal and the design table to design the TSCLE.	Students will reuse and remix the real assignment of the research brief to design the proposal and design table for the TSCLE prototype.	• A guest speaker from the library (Aaron S. McCollough) to talk about copyright and CC licenses for publishing online in OER repositories
	Publishing work students create themselves in the class is optional. Students can choose to publish their own work under a CC license or not.	Make the three assignments for this course publishable in an open journal or in a closed repository at the research university.	

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Micro-Cycle 2: Designing the Prototype of OER Intervention

The output of Micro-Cycle 1, a detailed design document that describes the core OER design principles and components of the OER intervention, informed Micro-Cycle 2 to design the intervention prototype in the course site in LMS Bb. The data sources used were the artifact analysis and the designer reflection. The results obtained from the artifact analysis showed the original structure of EDIT 730 prior to integrating the OER intervention into the EDIT 730 curriculum. The results generated from the designer reflection were illustrated in workflows of course assignments before and after integrating OER use and creation into the instructions of these main assignments.

Analyzing the structure of the Advanced Instructional Design course in LMS before integrating OER use and creation into the course curriculum showed that it is a modular course design. The contents are organized in the LMS Bb site week by week, as shown in Figure 25. The course was built in six modules, each representing a certain topic. Each module's topic includes relevant core reading materials and additional resources, as shown in Figure 26.
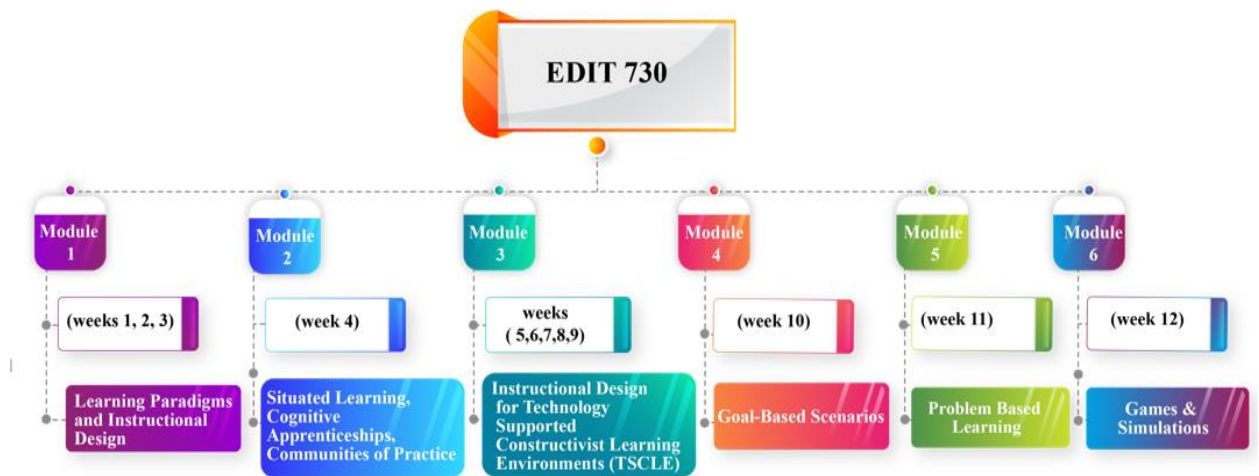
Figure 25. Diagram of course modular design week-by-week.
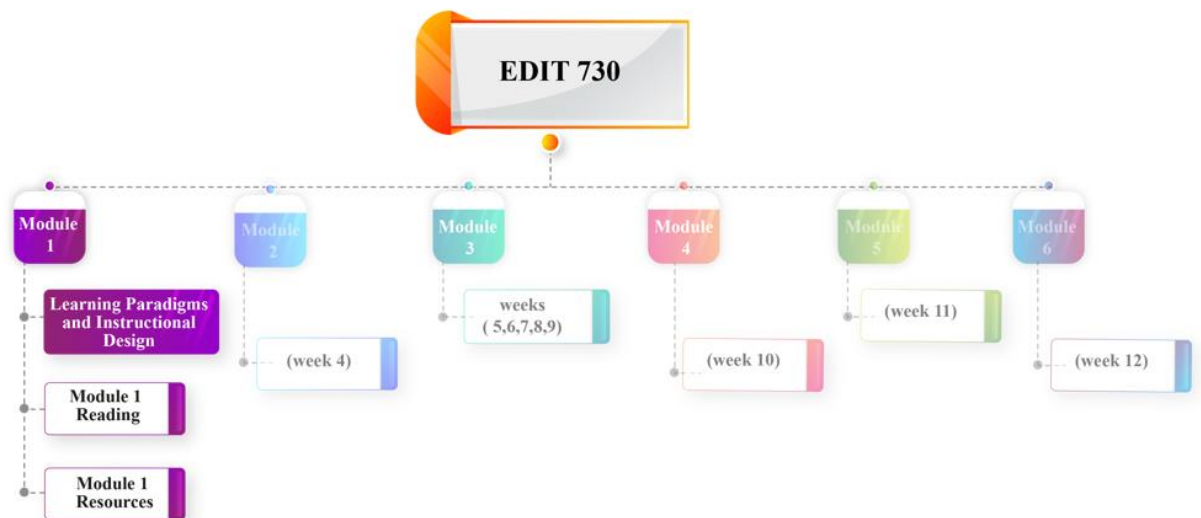
Figure 26. An example of module 1 design.

As explained in Chapter Three, the Advanced Instructional Design course is delivered using online and in-class activities. The online activities included an online

discussion forum, WordPress blog posts, and collaborative wikis. Employing these

different types of online activities led students to articulate and reflect on their grasp of

the reading materials, share multiple perspectives, and provide constructive feedback to

peers' posts, as explained below.

- Discussion Board: The online discussion board helped students to introduce

  themselves through meet-and-greet activities, share experiences or design

  problems they had recently encountered in work, and do group work in

  performing the assignments.

- Course Blogs: WordPress, an open-source content-management system, was

  used to create blog posts for this course. The instructor used the blog as a

  learning community for students to share their thoughts about and reflections

  on the course readings. The instructor gave students blogging guidelines, such

  as making the title of each post appealing and revealing, writing two to three

  paragraphs, and integrating media that supported the key points of the post.

  Each student was asked to comment on at least two peer blogs.

- Wiki: The wiki space in this course was used for sharing and collaboration

  purposes. The instructor used the wiki space for group work so that all

  members of a group could collaborate, exchange files, and work together on a

  project (e.g., such as the epistemology table and CLE assignment).

The analysis of the course structure resulted in creating a visual map of weekly activities

(Table 13) and an alignment grid of learning outcomes, learning experiences, assessment

activities, and reading materials (Table 14). This alignment grid provided a visible

structure of the course before integrating OER into the syllabus; this made it easier to

compare the course structures before and after the OER integration, as discussed later in

this chapter.

Table 13

Visual Map of Weekly Activities for EDIT 730 on LMS Bb (Spring 2019)

Course Modules	Week	Learning Activities
Module 1: Learning Paradigms and Instructional Design	Week 1: f2f Class	● Post a short bio ● Provide comments on the "Meet & Greet" forum ● Explore online resources under Module 1 ● Post a blog on the icebreaker activity ● Post a brief summary of a learning or training design problem that students have recently encountered or solved to the "Learning Design Problems" discussion forum ● Share the *objectivism-cognitivism-constructivism-connectivism* comparison table in the wiki space
	Week 2: Online	● Explore online resources under Module 1 ● Continue refining the epistemology comparison table based on new readings and instructor and peer feedback ● Begin researching for an example of a CLE with teammates ● Comment on two learning design problems posts in the discussion forum ● Post a blog on the week 2 readings; guidelines provided in Bb
	Week 3: Online	● Comment on two peer blogs from the week 2 readings ● Complete an epistemology comparison table ● Work on and complete the CLE assignment

Module 2: Situated Learning, Cognitive Apprenticeship, Communities of Practice	Week 4: f2f Class	● Explore online resources under Module 2 ● Post responses to Module 2 resources/examples on the discussion board; guidelines provided in Bb
Module 3: Instructional Design for Technology-Supported Constructivist Learning Environments (TSCLE)	Week 5: Online	● Continue the discussion on Module 2 readings/examples ● Complete the week 5 readings (Module 3) ● Participate in week 5 online discussions ● Explore online resources under Module 3
	Week 6: Online	● Continue the discussion of the week 5 readings ● Complete the week 6 readings ● Select a topic for the research brief ● Explore online resources under Module 3 ● Post a blog on chapter 4 ● Post a blog on the week 6 readings
	Week 7: Online	● Work on the research brief ● Comment on two peer blogs from the week 6 readings ● Complete the readings for week 7
	Week 8: Online	● *Spring break*
	Week 9: f2f Class	● Post a blog on chapter 8 ● Post a blog on the week 9 readings ● Discuss the week 7 readings ● Complete the week 9 readings

MODULE 4: Goal-Based Scenarios	Week 10: Online	● Comment on two peer blogs from the week 9 readings ● Explore online resources under Module 4 ● Participate in online discussions
MODULE 5: Problem-Based Learning	Week 11: Online	● Explore online resources under Module 5 ● Continue the discussion of the week 10 readings ● Complete the week 11 readings ● Create a comparison table across pedagogical models ● Post a blog on the week 11 readings
MODULE 6: Games and Simulations	Week 12: Online	● Explore online resources under Module 6 ● Complete the readings for week 12 ● Work on a final project proposal ● Participate in online discussions ● Comment on two peer blogs from week 11 ● Work on a final project proposal
Work and Consultation on the Final Project	Week 13: f2f Class	● Final project proposal due ● Class synthesis ● Discuss week 12 readings
	Week 14: Online Week 15: Online	● Complete final project
	Week 16: f2f Class	● In-class final project presentations

Table 14

Learning Outcomes/Learning Experiences/Assessment/Reading Materials and Resources Alignment Grid

Learning Outcomes What should students know and be able to do at the end of the course?	Learning Experiences What learning experiences (e.g., assignments, in-class activities, homework, lectures) will contribute to student learning?	Assessment Strategies What activities/assignments will you use to assess the learning outcome?	Reading Materials and Resources
Meet and Greet	*1. Online discussion forum* (Meet and Greet): Students share a short bio related to their personal interests, including experiences, achievements, interests, pictures, and what influenced them to join the field of instructional design. They share their LinkedIn profiles.	Students comment on at least two peers' posts following the *online discussion protocols and rubric.* The instructor reads and responds to each post.	
Develop an understanding of epistemological approaches to learning and cognition, such as objectivism, behaviorism, cognitivism, constructivism, situated cognition, and connectivism.	*1. Online discussion forum* (Learning Design Problem)*:* Students post examples of learning design problems. They share a brief summary of a learning design, instructional design, or training design problem that they have recently encountered as a learner or as a designer. This could be workplace related or school related. Who was the target audience? Who were they designing for? Was the content/skillset complex or ill-defined, or was it basic and well-defined? What was the design approach?	Students comment on at least two peers' posts following the *online discussion protocols and rubric.*	Module 1 reading

Develop an understanding of grounded design or theory-based design.	2. *In class and blog post in WordPress* (Icebreaker Activity): Students select one or two questions from the icebreaker activity they discussed in the prior f2f class and post a response to these questions in the blog area.	Students post in WordPress under the category "icebreaker activities" following the *rubric for blog posting* and *blogging guideline.* The instructor comments on the individual icebreaker activity in WordPress.	
	3. *Wiki* (Comparing Epistemologies)*:* Students share an individual epistemology comparison table in the group wiki area to compare the epistemologies of objectivism, cognitivism, constructivism, social constructivism, and connectivism based on the readings and resources assigned for this module. Students upload a draft to this area or in the discussion forum or bring a copy to class.	Students post an individual epistemology comparison table in the group wiki area. The instructor creates group areas in the wiki and later provides feedback on the individual epistemology tables in the group wiki areas. The instructor asks students to work in groups to consolidate the tables into one table and post it in a Word document in the group wiki area.	
Develop an applied understanding of constructivism and its implications for designing meaningful learning experiences using the Meaningful	1. *Blog Post* (Constructivism) *in WordPress:* Students post a blog on the week 2 readings regarding constructivist-based pedagogical models aligned with certain constructivist-related learning theories. The questions that students address in this blog post are in the *blogging guideline.*	Students post a blog under the category "constructivism" and comment on two peers' posts following the *rubric for blog posting and instructor guideline as well as blogging guideline.*	Module 1 reading

Online Learning Design Framework.	*2. Assignment* (CLE Criteria and Applications): Students work in teams to merge the epistemology table into one table and find a CLE example and share it in the wiki space. The instructor creates a tool link to Blackboard Collaborate Ultra to start a synchronous session for teams to finalize their CLE presentations, or they can use alternative tools such as Google Docs. In groups, students will (a) identify theoretical principles and instructional characteristics of CLEs based on the readings and additional reliable resources, (b) contrast these to the theoretical principles and instructional characteristics of Objectivist or Behaviorist Learning Environments, (c) find and share an example of a CLE that is technology supported and subscribes to the CLE principles and characteristics identified, and (d) critique the extent to which the selected CLE example embodies the principles of constructivism. The end product for this assignment is a 20–25 min in-class presentation that describes the findings of the group with respect to these items. More detail is provided on the course website under "Assignments."	F2f Assignment 1: CLE criteria and application presentation. The assessments used are • Instructor evaluation criteria • Peer evaluation	OER reading materials Examples of OER renewable assignments in MERLOT for previous students Examples of non-OER assignments for previous students in previous classes
Examine a variety of constructivist-based pedagogical models and instructional strategies and their implications for the design of meaningful learning experiences	*1. Online discussion forum (*Module 2 – Week 4 Readings and Activities)*:* Students discuss the resources and examples for Module 2 (week 4 reading). These examples are related to situated learning environments (SLE), cognitive apprenticeships (CA), and communities of practice (COP). This discussion will be distributed into three different threads: (a) The Jason Project and the WISE Project,	Students comment on peer posts following the *online discussion protocols and rubric.* The instructor interacts with students in the discussion forum and comments on their posts.	Module 2 reading Module 3 reading Module 6 reading

using a variety of learning technologies.	(b) communities of practices, and (c) cognitive apprenticeships.		
	*2. Online discussion forum (*Module 3 – Week 5 Readings/Activities)*: Students discuss the week 5 TSCLE readings. Three questions are posted in three different threads: Question One: How does meaningful online learning (MOL) relate to constructivism? Question Two: Have you experienced the concept of pedagogical ecology in your instructional designs? If so, in what ways? Think about the technologies you have used to design instruction and how these technologies might have impacted your designs. Question Three: Students answer questions related to instructional strategies align best with the pedagogical models of CA, SL, or COP.	Students comment on peer posts following the *online discussion protocols and rubric.* The instructor uploads a synthesis video for questions 1, 2, and 3 to the Module 3 discussion forum. The instructor asks student to provide a self-assessment for their performances in their participation in this discussion forum.	Module 3 reading
	3. Blog post (MOL Technologies)*: Students pick one or two of the technology categories presented in chapter 4 of the MOL book and present an example of a use case or design case in which they have used this category (or a particular technology within the category) and for what purpose.	Students post to a blog under the "MOL Technologies" category and comment on at least two peer posts following the *rubric for blog posting* and *instructor guideline* as well as *blogging guideline.*	Chapter 4 in textbook
	4. Assignment (Research Brief) *in wiki space:* Each student selects a constructivist-based pedagogical model (e.g., cognitive apprenticeship, community of practice, situated learning, problem-based learning) OR an instructional strategy (e.g., collaboration,	Students post the research brief paper in the wiki space. The instructor reviews and gives feedback for each	Research brief video overview by the instructor

	articulation, scaffolding, problem-solving), OR a learning technology (e.g., immersive tools, collaboration tools, knowledge representation tools) and writes a research brief based on the *5 Things You Need to Know About*: (a) What is it? (b) How does it work? (c) Who is doing it? (d) How effective is it? (e) What are its implications for instructional design? References should include course readings as well as new empirical research related to the selected model, strategy, or technology. More detail is provided on the course website under "Assignments."	student for correction and resubmission.	Lists of research journals and library searches, including open access journals APA style resources Examples of OER renewable assignments in MERLOT for previous students
Appreciate the importance of the linkage between theories of learning and instructional design practice.	1. *Blog post* (Assessment): students reflect on their understanding about chapter 8 for the week 9, 10, and 11 readings. (Week 9): *Blog post (*Assessment): Students post a blog reflection on assessment following the *blogging guidelines.*	Students post a blog under the "Assessment" category in WordPress and comment on at least two peers' posts following *the rubric for blog posting* and *instructor guideline* as well as *blogging guideline.*	Module 3 reading Module 4 reading
	2. (Week 10): *Online discussion forum* (Goal-Based Scenarios or GBS). Students reflect on the week 10 readings. Students explore two related CLEs: Joe Gainer's Greenville Collision Incident and Global Warming.	Students respond to the questions in the online discussion forum under "Goal-Based Scenarios." Students comment on peer posts following the *online discussion protocols and rubric.*	Module 4 reading Examples of OER renewable assignments and non-OER assignments

	The instructor gives students feedback on their responses. The instructor asks students to provide a self-assessment for their performance and their participation in this discussion forum.	
3. (Week 11): *Blog post* (Problem-Based Learning): Students post a reflection on two problem examples: (a) https://cornellcollege.edu/biology/fly/ and (b) The Informed Consent Case Study (Heterarchical Design) (http://otsvm.gmu.edu/oll/nada/gallbladderun/introduction.htm). Students evaluate the degree to which these problems might engage learners in the types of critical thinking and problem-solving skills that PBL requires.	Students post their reflection under the "Problem-Based Learning" category in WordPress and comment on at least two peers' posts following *the rubric for blog posting* and *instructor guideline* as well as *blogging guideline*. The instructor comments on students' posts.	Module 5 reading Instructor's video presentation on PBL
4. *Online discussion forum* (Comparing Pedagogical Models). Students download the comparison grid table to compare and contrast constructivist-based pedagogical models, including games and simulations, across the criteria provided. They can add their own criteria and comments as needed. Students post a draft of this table in this forum area.	Students post their pedagogical model comparison tables in the discussion forum area. The instructor reviews the pedagogical model comparison tables and provides comments.	Module 5 reading Module 6 reading

5. *Online Discussion Forum* (Games and Simulations): Students post their impressions of Impact Games, Virtual Heroes, and Quandry in this forum area.	Students post their responses about games and simulations in the discussion forum area.	Module 5 reading Module 6 reading
6. *Assignment* (Designing a TSCLE): Individually or in small groups, students select a constructivist-based pedagogical model or the meaningful learning characteristics and apply a grounded design approach (i.e., the MOL framework) to develop a prototype of the TSCLE for a specific target audience and learning content. The prototype demonstrates how supportive, dialogic, and exploratory instructional strategies are implemented.	The instructor comments and gives feedback on final project proposals in the wiki space prior to designing the prototype.	Final project proposal outline Questions to ask when designing a CLE
The final deliverable for this assignment should include the following three components: 1. A proposal (design document) describing the parameters of the TSCLE, including the learning problem, target audience, learning outcomes (knowledge/skills/content), pedagogical model or meaningful learning framework, instructional strategies, learning activities, learning technologies, and assessment approach. 2. A design table depicting the grounded design of the TSCLE. The table is a blueprint or storyboard of the prototype and should illustrate the mapping or alignment of the following design elements: (1) learning outcomes, (2) instructional strategies, (3) learning activities or tasks (what the learners will do) and how these activities support meaningful learning,	Students present the final project presentation in the class; students execute the projects following the performance-based assessment rubric.	Examples of assessing learning in CLE Examples of OER renewable assignments in MERLOT for previous students

(4) the learning technologies that will enable learners to accomplish these tasks, and (5) assessment criteria.
3. A prototype of the TSCLE showing the learning activities that the learners will engage in and the supporting learning technologies. The prototype can be developed in PPT or a technology of your choice (e.g., wiki, Google Sites, Wix, WordPress, Adobe Captivate).

Based on the designer reflection (Appendix I), workflows of the course

assignments were created to capture the changes in the EDIT 730 course before and after

integrating OER use and creation into the course curriculum (Figure 27 and Figure 28).
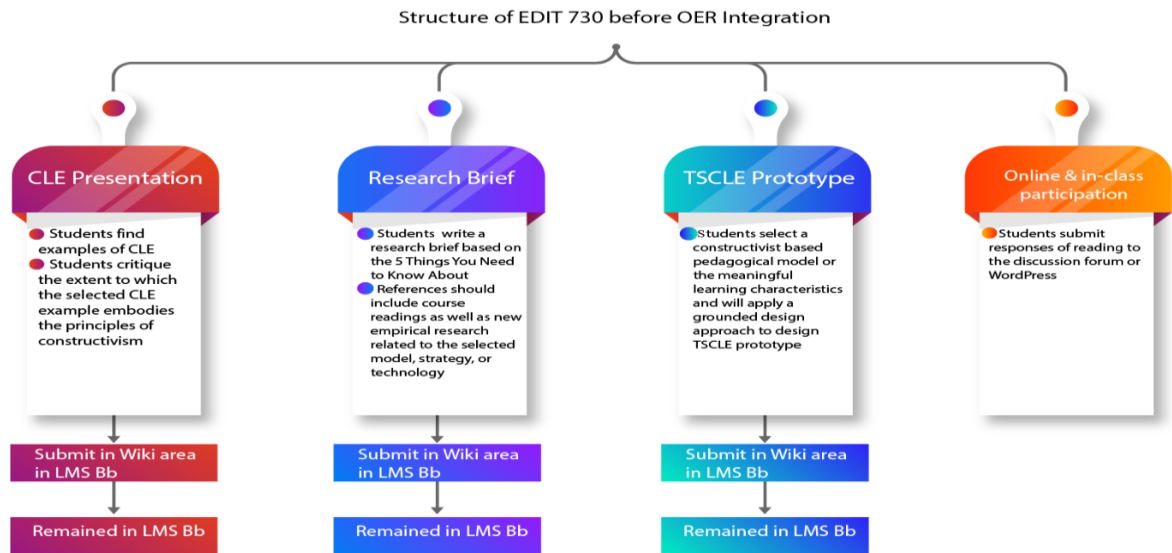
Figure 27. The workflows of course' assignments before OER integration.
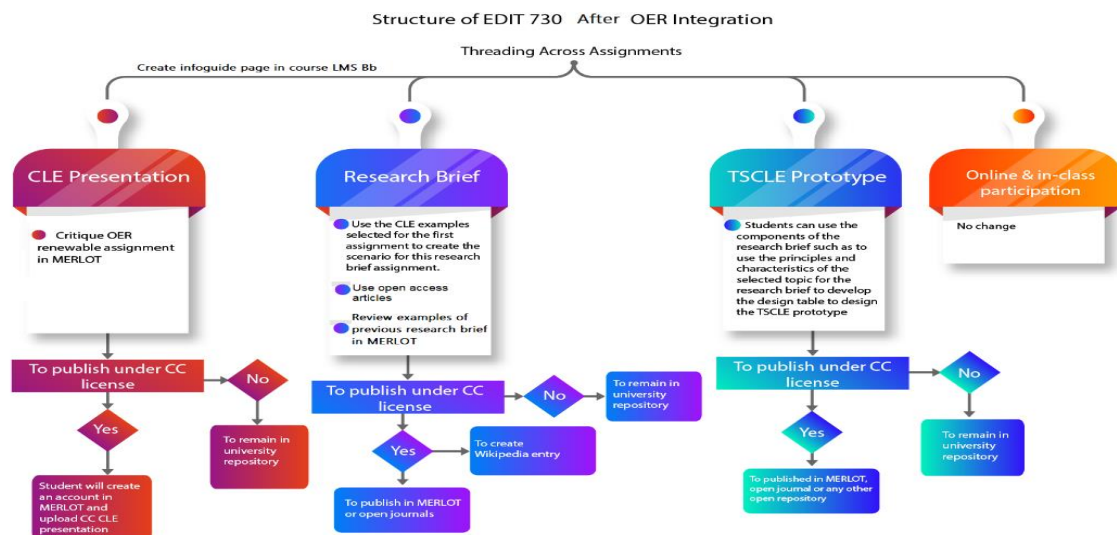
Figure 28. The workflows of the course' assignments after OER integration.

Local Impact Evaluation: Results

The purpose of this phase is primarily to evaluate the implementation of the open educational resources (OER) intervention prototype in the EDIT 730 curriculum. Distinctively, this local impact evaluation aimed to examine how these design principles were operationalized and implemented in a college course by examining their effectiveness in increasing students' awareness of OER and interrelated concepts and enhancing students' learning. In addition, this evaluation aimed to examine the OER intervention's effectiveness in the course design and provide evidence of any changes that the OER intervention induced to the current pedagogy of the selected course. Explicitly, this phase sought to answer the following research questions:

Research Question Two: How are the OER design principles operationalized and implemented in a college course?

A. What are the perceptions of students regarding the benefits and drawbacks of these principles in supporting their learning?

B. What are the perceptions of the instructor regarding the effectiveness of the OER intervention in the course?

C. Is there evidence of a shift in the pedagogy of the course?

As pointed out in the introduction of this chapter, the results are organized based on each phase's research questions. The data obtained from the pre-post course survey and the

focus group discussion based on students' perspectives answered research question A. The semi-structured interview based on the instructor's perspective answered research question B. The artifact analysis of course structure 2 answered research question C.

Second Research Question: How are the OER Design Principles Operationalized and Implemented in a College Course

This section discusses the data results that support answering how OER design principles were operationalized and implemented in EDIT 730 from the students' and instructor's perspectives as well as from the analysis of the structure of the course after integrating OER in the syllabus.

Research Question 2A: Students' Perceptions of the Benefits and Drawbacks of the OER Intervention on Their Learning

This section discusses the data results that support addressing research question 2A. The data sources used to answer this question are the pre-course survey, the focus group, and the post-course survey. Three themes emerged under this section: students' awareness of OER and the associated attributes; students' perceptions of the effectiveness and usefulness of the OER intervention in supporting their learning and opening teaching and learning practices; and students' perceptions of the usability of the OER intervention.

Students' awareness of OER and associated attributes. This theme compares whether students' awareness of OER and related attributes had improved after being exposed to the intervention. The results under this theme emerged from data analyzed from the pre-post course survey that took place in the early weeks of the course in week 3 and then in week 16. All participants (N = 8) responded to the survey. The results showed

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that the majority of participants (75%) were somewhat knowledgeable of the term *OER*

before they were exposed to the intervention. When the participants were asked about the

first time they heard about OER, most participants (62%) reported they learned it from

the instructor of this course (EDIT 730), two (25%) reported learning about it from the

Internet, and two (25%) commented that they learned about it from previous instructional

design classes, particularly from EDIT 705 (Instructional Design), during previous

semesters. In terms of the participants' awareness of the 5Rs practices, the majority (n =

5, 62%) of the participants were unfamiliar with the 5Rs practices. Interestingly, two

participants reported to somewhat know about the 5Rs practices; they indicated that they

had used the 5Rs with images. Additionally, data obtained from the open-ended questions

revealed that these two participants did not feel comfortable reusing content because they

stated that the "copyright has such a firm hold in my head that to me it does not feel right

to revise or remix material." and "I was aware of the content in MERLOT/or SlideShare,

but I was not aware that I could change it under Creative Commons laws." To compare

whether students' awareness of OER and related attributes had improved after being

exposed to the intervention, the majority of the participants (75%) stated that they had

become more knowledgeable of the OER and its related attributes (e.g., CC licenses, the

5Rs permissions). Only two (25%) of the participants were neutral. They indicated their

reasons for doing so were due to "the busyness of the semester (working full time and

taking eight graduate credits), I don't really remember." Another participant wrote, "[the

way] the information was presented, I didn't fully understand the full implementation of

OER until the end of the course."

Interestingly, the pre-survey data revealed that all participants were aware of the different types of open licensing: fair use, CC licenses, and public domain. In addition, five participants (62%) could distinguish between the copyrighted content and the open licensed content and understood the spirit and intention behind open licensing. These results contradict their limited awareness of OER. It can therefore be assumed that the participants acknowledge that there are different types of open licenses, but they were unaware of how, where, and when to use them. Comparing to the data of the post-survey revealed that there was no evidence found regarding students' understanding of the specific types of Creative Commons licenses and selecting the appropriate license for one's own work. Three (37%) participants were neutral, two (25%) strongly agreed, one (12%) agreed, one (12%) disagreed, and one (12%) strongly disagreed. Thus, very few students applied a CC license to their assignments. Only two students published their assignments in MERLOT and OER Commons.

In the same vein, the pre-survey data showed that the majority of participants (75%) were unaware of how the law defines their university's ownership of the copyright to their assignments. Therefore, the participants showed interest in knowing more about the legal aspects of the university's copyright ownership. The participants commented that, "I would be interested in knowing the policy. I hadn't thought about it until now," and "What is the university ownership copyright law? I feel like I should know it, but I don't." To compare whether students became aware of the university's ownership copyright after being exposed to the intervention, the data revealed that the majority of the participants (75%) were unaware of the university's copyright of class projects and

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assignments, until the end of the course. This result might have been influenced if the students were introduced to the copyright law throughout the semester by inviting an expert from the Mason Publication Group as it was proposed, but that could not happen.

With respect to OER databases, the pre-survey data showed that for the search engines students most often used on the Internet, all eight participants (100%) reported Google, and six (75%) reported Wikipedia. Very few participants reported that they used OER repositories. For example, three participants (37%) used the *Journal of Online Learning and Teaching* in MERLOT, two (25%) used the Directory of Open Access Journals, and one (12%) used the OER Knowledge Hub. Two participants mentioned other OER databases: Wikimedia commons and government/Internal databases. In response to the statement that the OER intervention enhanced students' awareness of different OER databases, 37% of participants agreed, 12% strongly agreed, 25% disagreed, and 12% strongly disagreed. Interestingly, regarding the positive responses, the most commonly used OER databases were MERLOT and OER Commons. For the negative responses, one participant stated they "only learned about MERLOT." One participant commented "why these were presented in static format; they were not integrated with the curriculum of the course." It seems that this participant did not use the InfoGuide page to search for resources. As a result, no evidence was found for the InfoGuide that students got benefits from using it to search for open-access articles to perform their assignments; specifically for the research brief. Pursuant to OER integration into this course, a collection of OER resources relevant to the content of constructivism was used as a supplemental resource. Thus, when the participants were

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asked whether they used any of the OER materials assigned as additional reading resources, for example, under Module 1 (Week 1: Exploring Educational Theory) and Module 3 (Week 6: Cognition and Instruction/Problem-Solving, Critical Thinking and Argumentation), less than half (37%) indicated that they used this OER content, while half of those surveyed reported that they did not use any of these OER resources. Regarding the participants' perspectives of the most important values of OER, seven (87%) believed that both "promoting shareability" and "equalizing access to information for all" are essential OER values. Following this, five (62%) reported "cutting down the costs of subscriptions and publications" as an OER value. Four (50%) perceived that "promoting the flexibility and customizability of OER" and "personalized learning" are the most vital values of OER. Few participants (25%) perceived that OER can contribute to continuous improvement to open content and promote reputational benefits for OER contributors.

Students' perceptions of the effectiveness and usefulness of the OER intervention in supporting their learning and opening teaching and learning practices. The data results under this theme emerged from the focus group discussion and the post-survey. All eight participants joined the focus group discussion, which lasted for 38 minutes at the end of the course, in week 12.

Since OER was integrated into the main assignments of EDIT 730, students were asked about the effectiveness of the main assignments, learning activities, and the content of the course in advancing their learning about designing a CLE. The data from the focus group showed that the majority of the participants found these assignments were effective

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and helpful. One participant indicated that the CLE presentation was helpful, and it was a proper way to start off the class because it focused on the concept of constructivism as a whole and aided students with grasping its principles. Similarly, the data obtained from the post-survey revealed that the majority of participants (62%) agreed with the statement that there was a continuum of knowledge across the main assignments (CLE presentation, research brief, and final project (TSCLE)) and learning activities (posting reflection in discussion forums and WordPress) of this course. Those who disagreed (12%) and strongly disagreed (12%) commented, "I think the assignments could have been sequenced better." It was suggested that the research brief should come first before the CLE presentation. Based on the discussion among the participants about the content of this course, the participants on the whole thought that the assigned reading materials about constructivism were effective and helpful; however, they considered these readings were being given in an order that made their understanding ambiguous and nebulous. Having students do the reading activities in this order led them to confront difficulties in connecting knowledge between theories, models, and instructional strategies. It was recommended to develop an initial process in the beginning of the course, such as preparing a lecture (e.g., a presentation) to illustrate an overview of the topics that would be covered during the course, then to start with the focus of the first week, outlining a certain theory and its related models, instructional strategies, and learning activities. As a result, the students would get a sense of the big picture of the core academic content of the course, and, week-by-week, they will focus on designing certain areas. Another suggestion was to start with a graphic design that would tie all the components together

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and gradually start with topics, week-by-week. Those topics would be highlighted as the students move through the course.

Another significant aspect of the continuum of knowledge within the Advanced Instructional Design course was obtained from the focus group: the common view among all students was to make connections across classes for the overall IDT program. All the students were inclined to link what they were currently learning to what they had learned in other classes within the IDT program. One suggestion was to also connect the assignments across classes such as EDIT 705 (Instructional Design), EDIT 730 (Advanced Instructional Design), and EDIT 704 (Instructional Technology Foundations and Theories of Learning) through a platform or database. They considered this development of knowledge throughout the entire program a baseline to prepare them for instructional design jobs. One student reported that, if the student-created OER approach employed "arbitrary just click[ing] around; it will be [useless]." Thus, students could go back and build upon their work in different classes. As one student reported,

> I think if it is connected to a particular class, I found it helpful. For example, I
> found out this [if it] is connected to this class, I want [to] use it as an example for
> this class. That is perfect [for us, which] is amazing. So many there. So, I think it
> is very helpful within a certain class.

To examine the effectiveness of threading across assignments in students' learning, students were encouraged to use the components of previous assignments to build the next assignment. Surprisingly, all students missed this concept of linking between assignments earlier in the course. The data from the focus group revealed that all students

appreciated this approach and were in favor of aligning and linking everything together. Common expressions that emerged were "I like the idea of reuse, but I don't know that we were able to reuse the information that we developed in the class," "I missed that part," and "that is not super clear for everybody." Only one student planned to connect across assignments, but it happened by chance. She stated, "I did for my research brief [a] goal-based scenario, and I want to do my final project on [a] goal-based scenario." Nevertheless, surprisingly, after the discussion of threading across assignments in the focus group session, the majority of students reused and repurposed assignments they executed in previous classes, as in EDIT 704 and 705. The post-survey data revealed that six of the eight participants (75%) reported "yes." that they used components of assignments from previous classes within the IDT program to execute the final project (TSCLE) for this course (EDIT 730). A surprising result reported from the participants was that they used previous projects they had done in EDIT 705 or 704 to build the final project in this class (EDIT 730). For example, the participants commented that, "I used the same idea for my EDIT 704 class, but I worked more on it for EDIT 730." Another participant reported, "I used my final project from EDIT 704 to inspire my final project for EDIT 730." One surveyed participant explained that "I used a Design Challenge project from EDIT 704 and applied a completely different pedagogical model for the EDIT 730 final project. I thought it worked really well for me." Another commented, "My TSCLE reused materials from my EDIT 705 project. They covered the same domain knowledge, but used it for different purposes." Overall, there were some suggestions raised to use threading across assignments in the course. First, it was suggested that the

concept of threading across assignments needs to be introduced earlier in the course, before starting the assignments. Second, it was recommended to define the problem/topic for the final project in the first weeks. That would be helpful for understanding the alignment of theories with models, instructional strategies, and related activities in the selected contexts. Third, students should select the strategies or topic for the research paper to gain in-depth understanding of the selected topic, to apply it in the final project. By doing so, students will be able to decide on the theory, model, and strategies that would be used for designing the final project (TSCLE).

When students were asked if critiquing CC CLE example presentations in MERLOT was helpful and contributed to enhancing their understanding of the core academic content, the principles of constructivism, and to subsequently executing their CLE presentation assignment, the majority of the students found critiquing previous students' work was helpful and a good method for looking at examples of assignments on the other side. One student reported, "It gave you an opportunity to sort of experience other environments." "Usually, if you just say 'go and look at this,' you usually will not do that." Only one student was frustrated and felt that she did not get the full benefit of revising these exemplary works in MERLOT due to the difficulties in understanding the slides without having the author's narration of the presentation. She stated, "It is like the slides [stand] on their own." One student preferred to have this revising activity at the end of the course. She reported, "When I was [commenting] that, I don't even know what I am doing." When asked about how future students could practice the 5Rs in reusing and revising previous students' work in MERLOT or in any OER repositories, there were

three main suggestions given: First, it was suggested to use the 5Rs practices over the entire IDT program. The students asserted that it would be good to see "what other focus is developing" to revise or rebuild upon it. One participant reported, "I would see much earlier on. Because by the time we are here, most of us are halfway and probably three-quarters through our program of study, and we [produced] greater resource at [EDIT] 590." Second, one participant argued that the "most [important] 5Rs practices is [revising]" rather than reusing and remixing. The student discussed using the Greenville Collision Incident case study that had been taught in this course to envision and build upon, using the principles of problem-based learning or situated learning. In the same spirit, other students thought it was important to revise the resource that got two stars on the OER databases and improve it to be a five star. As one participant reported, this revision process can occur only once "if it is improved." Moreover, in the same spirit, it was suggested that the professor give students a bad example of a CC assignment and ask them to take it as a starting point and build upon it to improve the weak areas. Then they should share the revised or remixed version. Third, it was recommended to develop a rubric to guide the revising process in critiquing the existing CC examples.

Students' perceptions of the concept of their contributions to renewable assignments in public online carried a mixture of responses combining promising and challenging thoughts. Overall, regarding the promising thoughts, all the participants approved of the concept of using student-created OER as a means of putting their assignments under a CC license and uploading them online in OER repositories. The students stated, "I think it is a good start, and I think it is promising" and "I think it is a

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great idea. It is maybe in its infancy stage." One of the participants admired this idea, especially about the fact that "it is going to be in public." Thus, students will have the opportunity to look at several "good examples" in a certain field. Another student reported that OER was a great idea and helped users figure out what they needed to learn at any time and any place, compared to before the technology innovation. One participant reported, "Nowadays, OER contains a large collection of free and open content online in various disciplines that can be accessed with a single click." However, as the idea moved forward, challenges and concerns were expressed about the quality and trust of this open content. Students showed uncertainty about the level at which they could trust existing open content, and they found it likely the quality would vary among the huge catalog of OER materials, similar to the content on Wikipedia. Participants reported, "There is no universal sets of standards for the quality of work that you find in OER," and "I feel that I have to double-check everything. Anyways, you can't just use [it] like a peer-reviewed [source]." When students were asked about their thoughts about the peer-review process that had been undertaken in this class between students and the instructor in terms of receiving comments to improve and refine their work, their responses were positive. They stated that the comments received from the instructor "could help" and improved the quality of students' work before releasing it to the public online. Data from the post-survey suggested that engaging students in collaborative work to improve CC products would be more effective.

Regarding the benefit students will get from making their assignments OER under a CC license, the majority reported that the portfolio building was the major benefit. One

participant commented, "It doesn't matter how small it is, [as long as it is a] paper that people [might be] interested in." Another commented that the benefit to students was adding the work to their resume, which was the only attractive factor to them. The students stated that they were became aware that OER content could be added to a resume only after they received an email from the researcher, providing an example of citations for works under a CC license. One participant indicated that "This how I think it looks in your resume." Some participants underlined that having a collection of examples was a good idea for looking at useful examples, whether we will reuse it or not: "It is like [a] slide share." In response, regarding whether the participants decided to share their own assignments executed in this course online under a CC license, most (75%) of those surveyed indicated that they do not want to share their own work under open license. Two discrete reasons emerged for this: First, the participants wanted to publish solid and perfect work. For example, some felt that "I need to edit it first," "I didn't want to publish less-than-perfect work," and "I wanted to do it, but when I post for everyone to see, I like my work to be completely solid, and I didn't think my project was ready for that." Another participant stated that, "I don't like the idea of publishing something on which I have been provided feedback and not yet incorporated, or something which I don't believe has my unique perspective." Second, other participants prefer to keep their own work private. That is, some participants thought, "I will only show [my work] to employers under strict supervision. I also don't like having a huge digital footprint" or "I like to keep my work as my own and share on my terms." Very few participants (25%) reported that they decided to publish their work online under a CC license. As the

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participants reported, the type of CC license they selected for their work was public domain and CC-BY-SA. They shared their assignments in both MERLOT and OER Commons. One participant reported publishing their research brief assignments on Cognitive Apprenticeship. It was proposed that it would be worthwhile to conduct data analytics to learn how many times the shared OER assignments were quoted and searched.

When students were asked if they intended to adopt and use the concept of user-generated OER and employ the 5Rs in practice in their field of practice, the data revealed that the majority of students were in favor of the idea of sharing and reusing materials that related to teaching. The participants indicated that this approach, in relation to the teaching aspect, was more practical. Educators can take the relevant, existing OER teaching resources and create activities with them in a certain field. Other educators can then reuse, revise, or remix them. As one student stated, "We have these authentic resources like articles or video clips, and then we created [activities with them], and then other people [changed] the activity or added something on it or [combined] things." Besides, it was asserted that employing this approach for teaching uses examples of lesson plans as a baseline for a new lesson plan to fit to specific learners' needs. In addition, students expressed that the final purpose of sharing OER is to end with a useful and meaningful product through building on existing data and explain what was new about it. As students discussed,

> I do have an application right now. I am working for a company that designs and develops skills for satisfying courses. As part of that, students do data analysis on

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their data set. Here what I [take] from the data set, and come and say here what I learned from that data set, here the visualization of that data, and that is absolutely something [that] could be given to other students. Here how can these data be repurposed and what can we learn from them. So, I think that is a good case where you could take students creating content as open access and have other people build upon it. There is no right or wrong answer.

Students' perceptions of the usability of the OER intervention. The supported data under this theme were gleaned from the post-course survey. The usability of the OER intervention was evaluated to determine to what extent the design and the instructions included in the intervention were easy to use. The obtained data will help to determine the weak areas in the intervention design, to aid with future refinement and improvement.

When the participants were asked if they found the instructions that directed them to select and critique a CLE presentation example in MERLOT easy to navigate (as shown in Figure 29), half (50%) of those surveyed reported "Yes." The data gleaned from the open-ended questions also showed that the instructions were straightforward and included links to finding assignments by previous students in MERLOT. For example, one participant commented, "I seem to remember that the link took me directly to the projects I needed to review. Nothing worse than trying to search through a huge database for what you are looking for. This was very easy to get to." Another respondent stated, "[The instructor] mentioned MERLOT on the first day of class, so I already had it in mind." In contrast, three (37%) of those surveyed reported "Somewhat," and one (12%)

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commented "No." In regard to these negative responses, the participants were asked

about their thoughts and opinions of the areas that could be improved in the intervention.

Three issues were identified from the data of open-ended questions: the difficulty and

time spent in searching for CC CLE presentations and in learning how to navigate in

MERLOT to locate presentation examples; the absence of criteria to use in reviewing

these CC presentation examples in MERLOT; and "the whole implementation of OER

needs a bit of work for the student to fully understand and leverage the concept with the

course work."

Figure 29. An example of the instructions that directed students to select and critique a
CLE presentation example in MERLOT

When the participants were asked whether they faced any difficulties in using the

commentary feature in MERLOT (Figure 30) to critique the previous assignments, as

well as in searching for examples of research briefs in MERLOT and WordPress (Figure

31), the majority (87%) of the participants reported that all the instructions were easy and

straightforward. In terms of the instructions the researcher sent via email to invite

students if they wished to turn their assignments into OER content under a CC license,

the majority of the participants (87%) agreed the instructions were clear and easy to

follow.

Figure 30. Instructions for commenting on the CC CLE presentation in MERLOT.

Figure 31. An example of the instructions to navigate the examples of a research brief in MERLOT and WordPress.

In response to questions that asked the participant students about additional information and resources that should be provided for future students, a suggestion was to include more examples on what repurposing looks like over two or three iterations. The participants explained that even this iteration can be undertaken through a quick activity to make students think through the process. Other respondents suggested that it was preferable to introduce the term OER and related concepts early in the degree programs. In addition, it was suggested that providing more samples of student projects was essential for practicing the 5Rs and showing the intentions behind OER usage and creation.

Research Question 2B: Instructor's Perceptions of the Effectiveness of the OER Intervention in the Course Design

This section discusses the data results that support addressing research question 2B. Interview data were the main source used to address this research question. The

interview addressed the change occurring in the course design due to integrating OER into its curriculum, the implications behind integrating OER and the 5Rs practices into the main assignments of the course, and the main considerations that should be considered for integrating OER into courses. Two predefined themes were generated under this section: the instructor's perceptions of the effectiveness of the OER intervention in the course design, and the instructor's perceptions of the main considerations for integrating OER into a college course.

The effectiveness of the OER intervention in the course design. As pointed out in Chapter Two, it is believed that OER can contribute to changing the pedagogy of courses, but the instructor of EDIT 730 did not perceive that:

> If we are defining pedagogy as the way I teach or the teaching pedagogy of the class, overall I did not perceive any change in the pedagogy. Now, of course, there were changes in the main assignments' instructions and guidelines.

So the change that occurred in the method of teaching of this course was in the way the students conducted their assignments: instructions were added to the curriculum of the course that guided students to practice the 5Rs by revising and critiquing students' assignments from previous classes. In regard to the 5Rs practices (retain, reuse, revise, remix, and redistribute), overall the instructor endorsed the commentary activity in MERLOT in the first assignment: "So, that part [critiquing previous assignments in MERLOT] I think is good because it gets them beyond looking at it, and they can understand what this assignment is about." Despite the instructor's positive attitude toward the critiquing activity, she felt that she struggled with understanding the intention,

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benefits, and even the meaning of the 5Rs, commenting "In terms of the 5Rs, honestly, I am having a lot of struggles with this." "I question these 5Rs sometimes because, like, what [does] remix and reuse mean and [what are] all the differences between them?" In addition, the instructor felt that applying the 5Rs in the course assignments had an endpoint; the question was always raised about how many times students could revise and improve the assignments under a CC license. Eventually, these renewable assignments would reach a point where there would be no further improvements to add. Moreover, the instructor argued that current students posted comments in MERLOT on assignments by students in previous classes; however, the original authors of these renewable assignments do not return to their assignments to use these comments for improving their work. However, the original authors received email notifications from the MERLOT platform about these comments. In this spirit, the instructor felt the obstacle encountered in regard to activating and scaling the 5Rs is an infrastructure problem, a technology problem, or a reach problem. The instructor perceived that MERLOT is not the ideal platform or model OER repository for incubating these valuable OER resources, since she felt there is no traffic in MERLOT where users would navigate through OER materials and practice the 5Rs. Besides, the instructor felt the benefits that could accrue to students from engaging in critiquing, revising, and remixing OER are unclear, and that could hinder students from engaging effectively in the 5Rs practices. The instructor explained it this way:

> Exactly. That is a fundamental point that you just raised. Once they have done with this course, once they graduate, they are not going to come back even if they

get those email notifications. They are not going to come back and look at the

critique and revise it. Because they don't have a benefit to revise it themselves. It

is like [it is] already done; they received the grade, and [are] done with the course.

The instructor believed that threading across assignments could influence the pedagogy

practices of courses: "I really very much like the idea of threading the assignments within

the course and across courses in the program. It is very powerful." She felt that the main

benefit was "to connect the dots across the courses and within the courses to really have a

much better understanding and a sort of applied understanding of the content of the

course." The instructor thought that making connection between assignments within the

course and across classes could encourage students to publish their assignments in public

under a CC license instead of keeping them in the LMS under each separate course; this

would also encourage the 5Rs in terms of revising and remixing practices. In addition, the

instructor found that encouraging students to thread across assignments is useful for them

to move a certain project from one level to the next. Thus, students would realize the

differences between behaviorist approaches versus constructivist approaches in designing

constructivist learning environments.

Although the instructor liked the idea of connecting assignments across courses

for the entire IDT program, she thought it would be difficult to accomplish, for several

reasons. First, it would be difficult to apply, due to the infrastructure of the academic

institution (e.g., credit system, course system). The instructor commented, "If it was a

cohort program, and all the students were going through the same courses at the same

time, it would be much easier." In addition, the instructor stated that the program is a

part-time program; students start the program at different times, and they start with different courses. In addition, the instructor pointed out that not all projects done in EDIT 704 and 705 can be repurposed to the next level. The instructor outlined that projects in EDIT 705 promote students to work with well-defined problems and are very simplistic; the focus was more on developing mastery. As a result, the instructor felt it would be difficult to thread assignments across pedagogical models or theoretical orientations (e.g., doing an assignment designed using behaviorism as an underlying theory, then repurposing it using constructivism) unless it could be done in a more complex or global context or using a broad problem or learning system that permits multiple pedagogies or theories. The instructor explained this difficulty in the following way:

> It can't be the same learning outcomes; it can't be the same learning objectives. They have to take that and have to totally remix it or re-pitch it in a much more broader and complex context. Because in a constructivist learning environment, every learning environment starts with a real-world dilemma, with a problem, with a case example, and with an authentic task, another consideration should be undertaken, and that it is not how they have been doing [it] in 705 and 704.

Furthermore, the instructor found that threading assignments across multiple courses is difficult because the course assignments usually need to adhere to the assignment criteria in a particular course. That is, this course has a semi-constructivist design approach; the learning outcomes should be at the very high end of Bloom's taxonomy. It does not work with traditional learning environments that use a linear teaching approach. The instructor explained that this way:

I mean I can have them design a constructivist learning environment for teaching

a very linear procedure task or for designing an environment [where] there is a lot

of memorization of facts. That doesn't work in a constructivist learning

environment. So, they have to have a much more complex learning problem or

they have to have very high-end learning objectives for their target audience in

order to be able to even begin thinking about designing a constructivist learning

environment. So, I made this very clear for them this semester. I said, I am open

[to that] if you want to repurpose as long as you can make an argument that this

project lends itself to a constructivist learning environment.

Nevertheless, a connection is currently occurring in the IDT program through the digital-

e-portfolio, and through some courses such as EDIT 732 and EDIT 752. For the final

portfolio class (EDIT 701), students were asked to write an essay about what they learned

in the IDT program. Particularly, they return back to each course individually and reflect

on takeaways from each course based on the International Board of Standards for

Training Performance and Instruction (IBSTPI) competencies. Moreover, they were

asked to show how they learned about analysis and design, what projects supported their

understanding of the principles of the field, and which assignments helped to connect that

understanding. In addition, EDIT 732 and EDIT 752 are great examples of sequencing

assignments at the level of the IDT program because they "are totally connected."

With respect to students' feedback regarding resequencing the main assignments

of EDIT 730, the instructor disagreed with the students' pedagogical standpoint. The

instructor believes that assignments are connected to the content and to students'

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understanding of that content and the learning objectives of the course, rather than being connected to each other. In addition, the instructor was against turning the course into the final projects, starting from the beginning. As the instructor reported, "I would not agree with the pedagogical standpoints to move the research brief assignment to the beginning because I start them to have an argument." The instructor explained that students in the beginning of the semester had not yet done the required reading for the research brief assignment. In addition, the instructor considered that starting with the research brief would go against the grounded theory-based design to empower students to link and connect their instructional design to theory. The instructor pointed out, "I truly believe that and the research supports that when you ground your design in a specific theory, your instructional design will work much better and will have a better chance of succeeding." Consequently, to overcome students' missing the instructions for connecting between assignments within the course, the instructor introduced this idea in the first week in this spring 2020 semester. In addition, the only change the instructor made in the guidelines was moving students' contributions of a learning design problem to the 12th week in the class, just before they start working on the final project. The instructor justified it this way:

> I used to ask them in the beginning maybe in the first 2 weeks to go [to the] online
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> discussion board and contribute a design learning problem, learning-training
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> problems that they [probably] facing at work, or something, and they usually do
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> that, and I give them feedback, and they give each other peer feedback, and then,
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> they sort of [forget] about it, and it is [a long time before] the final project. But

what I did this spring, based on some of the feedback from the intervention or

what you did in the class last fall, is that I moved this design learning problem

now to later in the course.

Regarding the absence of tracing students' assignments within this course, the instructor

proposed further investigation to conduct "a descriptive count" for students in the last 5

years on what topic they selected for the research brief and how many of them ended up

designing the final project using the same topic they investigated in the research brief or

using the same instructional strategy they investigated in the research brief. Table 15

presents the rates of students who used the topic they investigated in the research-brief

assignment to create the proposal for the final project (TSCLE) in the last 4 years (eight

semesters). As Table 15 shows, few students (ranging between three to five students in

each semester) used the strategy of connecting the assignments within the course. Their

intentions behind using this strategy are not known, including whether it is by chance or

intentional and linked to theory.

Table 15

Descriptive Count for Students' Threading Across the Assignments of Research Brief and Final Project in the Last 4 Years

Semester	Total Students	Applied	Not Applied
Fall 2015	23	5 (20%)	18 (78%)
Spring 2016	22	3 (13%)	19 (86%)
Fall 2016	10	1 (10%)	9 (90%)
Spring 2017	21	1 (5%)	20 (95%)
Spring 2018	10	2 (18%)	8 (72%)
Fall 2018	12	3 (25%)	9 (75%)
Spring 2019	10	2 (20%)	8 (80%)
Fall 2019	8	1 (13%)	7 (88%)

Regarding students' preference on sharing teaching resources under the CC license rather than students' assignments, the instructor agreed with students' preference to share teaching resources under an open license. Thus, other instructors, professors, or any educators around the world can take examples, such as assignment instructions, and reuse and customize them to meet their learners' needs or align with the course learning objectives. The instructor stated, "That's a great point. I agree with this. I am very much

in favor of that." However, the instructor insisted that the lack of infrastructure across the university will prevent faculty from sharing their teaching resources. She commented, "I like the idea a lot of having an open repository where different faculty from different colleges can share example assignments, but there is no infrastructure again across [the] university to do that sharing." Meanwhile, the most common methods for sharing teaching resources and strategies among educators are through conferences, journals, and web searches. The instructor commented, "I think that mainly how faculty share what they [are] doing in coursework is mainly through conferences for now at least, and we do search online a lot to find examples." "[We] learn about those as examples from peer-reviewed journals, official journals." The instructor underlined that even students' assignments that are under a CC license can be shared online—where other professors in other universities around the world can use them as examples of best practice.

It was suggested in the enactment phase to build a database (a digital repository)—a component of the intervention—to host previous and current students' assignments, which are open or closed assignments. When the instructor was asked how she would describe this suggestion, she reported that she believed it would be beneficial as a database rather than as a database of OER with CC-BY content. The instructor stated that the most significant benefits of this database are that instructors can navigate through other instructor's courses, teaching resources, and strategies; instructors can see all students' assignments with the possibility of grouping them by year or by semester or by assignment; and they can readily look at examples of constructivist learning environments. The instructor commented, "I think that would be great if we can do that.

We can do that, but I am not sure if the database needs to be the CC-BY database. That is what I struggle with."

When asked about the continuation of implementing an OER intervention in future courses, the instructor reported that she will not continue the use of the OER intervention. OER use will only remain in regard to showing students the exemplary examples of assignments in MERLOT that are under CC-BY. In addition, the instructor will not continue to implement the 5Rs (e.g., commentary and critiquing activities). The instructor commented, "I am not going to ask them to critique the specific resources, but I am going to keep the resources." That is, the instructor believed that students do not get any benefit from these activities: In addition, the MERLOT platform or database is outdated, and nobody uses it; she stated that nobody acknowledges that these submitted open resources are scholarly publications (e.g., the presentations).

The main consideration for integrating OER in a college course. From the instructor's perspective, there are four main consideration for integrating OER and the 5Rs into courses: (a) The top management in an institution must embrace the philosophy and paradigm of OER and develop a policy of OER usage and creation. (b) The benefits of OER for instructors should be explained and made tangible. (c) The course pedagogy should move toward a constructivist approach to teaching; lectures and exams are based on a behaviorist approach, which does not support the 5Rs principles of OER. (d) Faculty need more specific guidelines, examples of best practice, and training on how to use OER and the 5Rs in the curriculum.

When asked about the fundamental principles the faculty must consider for integrating OER into a course beyond accessibility to open content, the instructor emphasized that the top management (e.g., leadership of the university, provost) in any organization must embrace the usage and creation of OER. The top management must develop a policy to support and advance integrating OER into the curriculum to empower the change in the educational practices and the way the faculty design the curriculum. Without the presence of policies from the top leadership, it would be difficult to spread an OER integration initiative across programs or across departments. Furthermore, the instructor pointed out that even for instructors in the organizations who want to use OER in their courses, the benefit to the instructor must be predefined and tangible. She commented, "I want to shed light on these things: What is the benefit? What do I get out of it? What do my students get out of it?"

Regarding the pedagogical approach that might advance integrating OER beyond accessibility in courses, the instructor stated that it is apparent that the behaviorist approach, where the courses are exam and lecture-based, instructors give lectures, and students do homework, would not help with integrating OER into these course curricula. The instructor argued that the behaviorist approach will not work in regard to engaging students in the 5Rs in collaborative group work. However, when the instructor integrates the 5Rs from the beginning of the course, provides students the materials and content, and then asks them to learn from it through critiquing and revising practices to fill in the missing knowledge, the instructor commented,

Then that totally supports the constructivist learning pedagogy because you are

not lecturing them and telling them here what you need to know, and now I am

going to give you an exam and this is the exam. Show me what do you know

exactly about that learning.

Finally, the instructor believed that faculty need specific guidelines and best-practice

examples of how other instructors integrate OER use and creation and the 5Rs into their

course curricula. The instructor argued, "Is it just with assignments or do you also have it

with the reading content?" In the end, providing good guidelines or interventions for

integrating the 5Rs into course curricula contributes to influencing instructors to rethink

the pedagogies and to move forward to the constructivist teaching approach.

Research Question 2C: Evidence of a Shift in the Pedagogy of the Course

This section addresses the research question 2C. The main data source used to

answer this research question is the artifact analysis of the course structure after

designing and implementing the OER intervention in EDIT 730.

Structure 2 of EDIT 730 (after embedding the OER intervention) was a modular

course design. There were six modules in the course's Structure 1, before integrating the

OER intervention into the course syllabus. The course was restructured into five modules,

due to the change that was made to the timeline for the entire course. In Structure 1,

Module 4 was delivered in week 10, and Module 5 was delivered in week 11. In Structure

2, they were combined into one module to become Module 3, which was delivered in

weeks 5 and 6 (Figure 33). The pedagogy, content, and components of the course were

not changed due to integrating OER into the course syllabus. A section of the OER

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intervention was embedded in the course LMS that introduced students to the

intervention and to the concept of OER and associated attributes; the instructions directed

students to perform activities that are related to OER use and creation. As previously

mentioned in the enactment phase above, the OER and 5Rs practices were integrated into

the instructions of the three main assignments (CLE presentation, research brief, and final

TSCLE project). Thus, a change occurred only in performing these assignments.
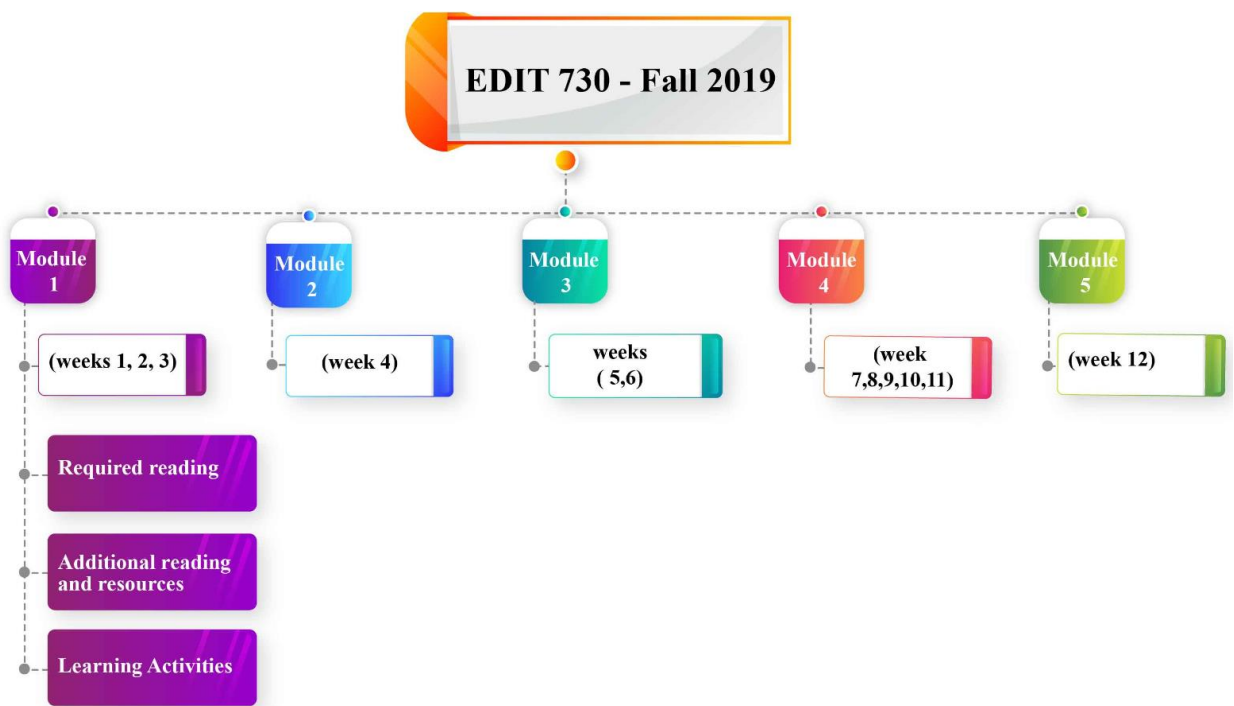
Figure 32. Structure 2 of EDIT 730.

During the implementation phase, some instructions were added to the OER

intervention. These instructions are related to performing the main assignment. As shown

in Table 16, the instructor tended to encourage students to thread across assignments by

giving them options to use the learning design problem they posted in the discussion

forum, to use the CLE example for the first assignment, to use scenarios they studied in

the Meaningful Online Learning book, or to use the unsolved or solved scenario to create

a scenario for the research paper. Table 16 illustrates a visual map of the weekly activities

for EDIT 730 on LMS Bb that focused only on the instructions related to the OER

intervention during August 27 and December 10.

Table 16

Visual Map of Weekly Activities for EDIT 730 on LMS Bb Focused Only on OER Intervention (August 27-December 10)

Course Modules	Week	The Main Assignments	Learning Activities and Instructions Have Been Embedded In the Instructions of the Assignments To Integrate OER and 5Rs Practices
Module 1: Learning Paradigms and Instructional Design	Week 1: f2f class		● Explore resources under *OER Intervention*
	Week 2: Online	A. Constructivist Learning Environment Criteria and Application	● Review *existing CLE example presentations in the MERLOT* database and provide comments per assignment details (see below on how to access MERLOT) 　How to use MERLOT 　○ Creating an account in MERLOT 　○ Add a comment in MERLOT
	Week 3: Online		
Module 2: Situated Learning, Cognitive Apprenticeship, Communities of Practice	Week 4: f2f class		● CLE Presentations in class ● If you wish to *upload your CLE presentation to OER* databases such as *MERLOT or OER Commons* in order to make it an OER, follow the instructions under the OER Intervention section and that sent in the email

Module 3: Goal-Based Scenarios, Problem-Based Learning	Week 5: Online Week 6: Online		
MODULE 4: Instructional Design for Technology Supported Constructivist Learning Environments (TSCLE)	Week 7: Online Week 8: Online	B. Research Brief	• Visit examples of research briefs in MERLOT, you can cite these examples or build on them. • Consider to use the *learning design problem* you shared in Week 6 or the *CLE presentation example* as a "potential scenario" for the research brief • Or, consider to use the scenarios in the MOL book or the "unsolved scenarios" or "solved scenarios" to create the potential scenario for the research brief
	Week 9: f2f class		
	Week 10: Online		
	Week 11: Online		• Research Brief due in Wiki space • If you wish to *publish the research brief as an OER*, your options are *MERLOT, OER*

			Commons, or Wikipedia; follow the instructions under the OER Intervention and that sent in an emil, but be sure to wait until you have received feedback from the instructor before publishing the research brief
MODULE 5: Games and Simulations	Week 12 : f2f class	C. Designing a Technology Supported Constructivist Learning Environment (TSCLE)	● Work on final project proposal; consider using the *learning design problem* that you submitted to the discussion forum and/or the *research brief components* to frame the proposal ● See examples of *previous project proposals in MERLOT*
Work and consultation on final project	Week 13: Online		
	Week 14: Online		
	Week 15: Online		

Week 16: f2f class	• In-class Final Project Presentations • Consider uploading the components of the final project: the proposal, the design table, and the prototype, to an *OER repository* such as *MERLOT or OER Commons*

Chapter Summary

In summary, Chapter Four provides a thorough analysis of data results obtained from the Enactment Phase and the Local Impact Evaluation Phase. There were two sets of research questions guiding the analysis of the data results. The results obtained from the Enactment Phase addressed the first set of research questions that produced the core OER design principles that determined the components of the OER intervention prototype in EDIT 730. The results led to these conclusions.

- OER should be integrated into a course using learner-centered pedagogical models with constructivist approaches to teaching.

- OER should be integrated as a part of the pedagogy of the course.

- The main goal for integrating OER into college courses is to make students learn about the concept of OER and its related attributes (e.g., different types of CC licenses, the 5Rs, and OER repositories, university's ownership of the copyright).

- The intention behind the 5Rs is not limited to compiling parts of open content to create new OER materials; the meaning expands to include enrichment, supplement, argumentation, and explanation similar to the scholarly publication process.

- Publishing personal work under a CC license must be optional.

- The pedagogy approach of the Advanced Instructional Design is a learner-centered, semi-constructivist approach to teaching.

- The main idea for integrating the 5Rs into EDIT 730 was threading across assignments, which implies allowing students to reuse what they executed in one assignment to build the next assignment within a course.

- The concept of threading across assignments was applied to the three main assignments of the course. The instructions that directed students to perform the activities related to OER use and creation (including the 5Rs) were embedded in the instructions of these main assignments.

- Six main 5Rs activities were embedded in the instructions of the three main assignments:

  1. Reuse the previous renewable assignments in MERLOT and WordPress as exemplary examples of the three main assignments.

  2. Select one example of a CLE presentation by previous students that was published in MERLOT under CC license, and critique the selected example based on the criteria of the assignment.

  3. Cite and build on one of the research-brief assignments in MERLOT and WordPress for previous students that are under CC license. To create a scenario for the research-brief assignment: use the CLE examples selected for the first assignment or use the learning design problem shared in the discussion forum.

  4. Your references can include open-access articles related to the selected model for the research brief.

5. Use the learning design problem shared in the discussion forum or the components of the real assignment of the research brief to design a proposal and design table for a TSCLE.

6. Share the assignments executed in this course under an open license in OER repositories, which is optional.

- The importance of creating a database within the university to deposit students' work, so students could come back to build on it for different classes and/or publish it.

The results obtained from the Local Impact Evaluation Phase addressed the second set of research questions based on the perceptions of students regarding the benefits and drawbacks of OER design principles in supporting their learning, the perceptions of the instructor regarding the effectiveness of the OER intervention in the course, and an analysis of changes in the course structure after embedding the OER intervention in the course syllabus. The results led to these conclusions.

- Integrating OER into EDIT 730 did not contribute to change in the current pedagogy of the course, but it did contribute to change in the main assignments' instructions and guidelines in terms of the way the students conducted their assignments.

- The most important values of OER are promoting shareability, equalizing access to content for all, cost reduction, publication credits, and personalization.

- OER intervention enhanced the students' awareness of OER and associated attributes; however, no significant evidence was found regarding students'

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understanding about the different types of CC licenses and the usefulness of InfoGuide in supporting students in executing their assignments.

- All students were unaware of the university's ownership of the copyright.

- Students favored aligning everything and linking it together by making connections between knowledge across the assignments within a course and across the classes for the entire academic program through a platform or a database.

- There is a continuum of knowledge across the main assignments and learning activities within EDIT 730.

- The majority of students applied the concept of threading across assignments in the final project, using the previous assignments and projects they had done in EDIT 704 and 705 to build the final project for EDIT 730.

- Threading across assignments encouraged the instructor to generate new strategies to encourage students to use the components of previous assignments within the course to connect knowledge and understanding across the main assignments and learning activities.

- Students endorsed students' contribution to OER creation (renewable assignments), but they showed uncertainty about the quality and trustworthiness of the existing open content.

- Critiquing previous students' renewable assignments in MERLOT helped students to look at examples of assignments from previous students in different disciplines at different levels, to think what the assignment is about, to execute their own

assignments, and to provide comments to the original authors to improve their assignments.

- The perceived intention behind the 5Rs is to build on existing data and to explain what is new about it, beyond only remixing and revising. However, significant questions remain about the meaning and intention of some of the Rs, and differences between some of the Rs in the 5Rs framework are still unclear at this point, due to several challenges.

    o It is believed that the MERLOT database is not an ideal platform to encourage active participation in repurposing and creating OER, so there is a technology issue – a need for further development of the platform with more features.

    o The benefits that faculty and students will get from engaging in the 5Rs are unclear.

    o There is an endpoint for these renewable assignments, where their content has been repeatedly improved to the point that no further improvements can be made.

- Sharing teaching resources under a CC license is more practical for exchanging best practices of teaching strategies and building resources upon one another, along with sharing students' assignments.

- Students and instructors favored mainstreaming the concept of threading assignments across classes for the entire IDT program. However, that is difficult to accomplish, for several reasons:

- There is an infrastructure issue with the academic institution, when the institution is based on a credit system and a course system.

- It is difficult to thread assignments across pedagogical models.

- Each assignment needs to adhere to the assignment's criteria for each class.

- Threading across assignments could influence the pedagogy of courses by supporting students in connecting their knowledge across the courses and within the courses. This could help students gain a better understanding of the course content and apply their understanding to the various assignments and projects in the program. In addition, building assignments upon one another could encourage students to share their assignments online under CC-BY instead of keeping them in the LMS. This in turn could encourage students to reuse and remix these published open resources.

- The instructor will not continue the use of the OER intervention in the course. OER use will only remain through showing students some exemplary assignments in MERLOT that are under CC-BY.

- Students did not fully understand the concept of integrating OER and threading across assignments in the course until near the end of the course.

- These are the main considerations for integrating OER into courses in higher education:

  - The top management in an institution must embrace the philosophy and paradigm of OER and develop a policy of OER use and creation.

- o The benefits of OER for instructors and students alike should be clearly explained.

- o The course pedagogy should move toward a constructivist approach of teaching.

- o Faculty need more specific guidelines, examples of best practices, and training on how to use OER and the 5Rs in the curriculum.

- The instructions related to OER intervention were easy to follow, clear, and straightforward.

Chapter Five

The purpose of this design-based research study was to design an integrative open educational resources (OER) intervention in a college course that will manifest in open educational practices (OEP). A literature review found that the progress of the OER movement over time has been very slow (Al Abri & Dabbagh, 2018). Over the past 17 years, the OER movement has had several goals: increase awareness of the term "open educational resources" and related concepts among users and associations, establish different OER projects and initiatives, produce OER content, and develop digital repositories to host all the OER content on the Internet (William & Flora Hewlett Foundation, 2013; Wiley et al., 2014). However, to date, the OER movement is far from reaching its essential goal of advancing the quality of education: using OER to reduce the cost of education by making open content available online with free access for everyone worldwide (DeBarger, 2019). The current discussion among OER researchers, experts, and educators is to improve the use of OER beyond providing free access to open educational content and resources (Al Abri & Dabbagh, 2019; DeBarger, 2019; Ehlers, 2011; Geser, 2012; Paskevicius & Irvine, 2019; Wiley, 2017). Furthermore, studies have indicated that the use of OER in education lacks explicit evidence-based practices for informing the effectiveness of OER in supporting the teaching and learning process (Ehlers, 2011; Geser, 2012; Masterman, 2015; Pitt, 2015). The absence of such empirical

evidence engenders questions about the features and characteristics of OEP that could spur faculty to innovate their pedagogical practices and engage students in the use and creation of OER (Al Abri & Dabbagh, 2019). In this context, OER advocates encourage scholars to investigate the potential of OER in innovating pedagogical models that can be put into practice at the course level (Al Abri & Dabbagh, 2019; DeRosa & Robison, 2017; Masterman, 2015; Pitt, 2015). Therefore, this study sought to generate design principles for integrating OER into a college course, use these principles to design an OER intervention, and evaluate the effectiveness of these OER design principles from different perspectives. The following two research questions guided this study:

Research Question One: What are the design principles that support the integration of open educational resources (OER) in a college course?

Research Question Two: How are the OER design principles operationalized and implemented in a college course?

This chapter provides a discussion of the main research findings of this study along with linkage to the literature review (Chapter Two). Finally, this chapter presents the implications for practice, makes recommendations for future research, discusses limitations of the study, and addresses research validity.

Discussion of Main Research Findings

The design of the OER intervention prototype was undertaken through inputs, process, and outcomes (Figure 33; Plomp, 2007):

- The inputs are the theoretical conjectures (Table 3) that were gleaned from the Informed Exploration Phase.

- The process is the design and development cycles of the OER intervention prototype that were conducted in the Enactment Phase.

- The outcomes are the main research findings of this dissertation study that were obtained from the Local Impact Evaluation Phase. They are discussed after Figure 33.

Inputs	Process	Intervention Outcomes
Theoretical Understanding	**EDIT 730-LMS Bb**	
A course-enabled OER use and creation		
Potential benefits of OER Attributes of openness Principles of open pedagogy and OEP 5Rs framework Students as visible and active participants Learner-centered approach using constructivism or connectivism Learner-generated content Reflective practices Collaborative effort Peer review Ehlers' matrix of pedagogical models and openness Lessons learned from best practices of OER creation Learner is motivated to share works with others	Learner-centered pedagogical model Semi-constructivist approach of teaching	1. Increased students' awareness of OER and related attributes 2. Led to generating heuristic design principles for OER integration in a college course 3. Improved making connections between knowledge within the course and across the IDT academic program 4. Encouraged reflective practices on the current pedagogy 5. Showed the need for digital repositories for all course's assignments and creating connected community for OER use and creation
Impediments	-Delivered through online and face-to- face sessions -Involved Individual and collaborative activities & constructive assignments -Employed 5Rs through threading across assignments -Provided a collection of previous students' assignments in MERLOT and WordPress -Integrated the use and creation of OER -Critiqued CC CLE presentation example in MERLOT -Visited research briefs in MERLOT and WordPress to cite them or build on them -To publish assignments under a CC license in MERLOT or OER Commons -To build a digital repository for all course' assignments and open database for educators -Used OER under additional reading -Created OER intervention section in LMS	
Lack of the following: Quality, support, flexibility, funding, time, efficiency, self-efficacy, usefulness, and insufficient OER to build on		

Figure 33. Inputs, process, and outcome of the OER intervention prototype in EDIT 730

OER intervention outcomes. This is a list of the five outcomes of the integration of OER into the Advanced Instructional Design course. The list is followed by a discussion of each outcome.

1. It increased students' awareness of OER and related concepts.

2. It led to generating heuristic design principles for OER integration into a college course.

3. It encouraged reflective practices on the current pedagogy and trajectory of the course.

4. It improved making connections between knowledge within the course and across the IDT academic program.

5. It showed the need to build digital repositories for all course assignments and create a connected community for OER use and creation.

   1. <u>It increased students' awareness of OER and related concepts</u>. It is known from the literature review in Chapter Two that students across higher education institutions lack awareness of the term "open educational resources" and the intentions behind relevant concepts. The results in this study showed that the majority of students became knowledgeable about OER as a result of integrating the OER intervention into the course. Students became aware of OER and copyright information (e.g., fair use, CC license, and public domain)**,** the OER databases (MERLOT and OER Commons), and the process of the 5Rs (retain, reuse, revise, remix, and redistribute), which are the essential drivers toward adopting and using OER for educational purposes. However, the study found no

significant evidence of students' understanding of the different types of CC licenses, due to the short-time investigation that was conducted for only one semester.

2. <u>It led to generating heuristic design principles for OER integration into a college course</u>. This second outcome was the focus of this dissertation study: generating OER design principles. This study produced nine OER design principles that can be used by faculty in higher education intuitions as formal guidelines for integrating OER use and creation into their courses. These OER design principles will be discussed later in this chapter.

3. <u>It encouraged reflective practices on the current pedagogy and trajectory of the course.</u>

4. <u>It improved making connections between knowledge within the course and across the IDT academic program</u>. This study found that integrating OER into EDIT 730 encouraged the instructor to reflect on the pedagogy of the course she taught and create new strategies of teaching and learning. This result aligns with previous studies such as Pitt (2015), who concluded that the use of OER in a course encourages educators to critically reflect on their pedagogy and innovate teaching and learning practices to enhance students' learning. Similarly, this study found that students reflected on the sequences and connections among the learning activities and assignments within the course, EDIT 730, and across assignments for the entire IDT program; this strengthens the idea of "threading across assignments" as a result of integrating the 5Rs in EDIT 730. These findings correlate with the studies of Srinivasan (2019) and Perrow (2017) about making connections between successive modules and assignments. Srinivasan (2019)

pointed out that students get frustrated when they don't find these connections, which means that they have to wait until the end of the semester to start realizing the connections and tying everything together. Together, these results will support students to develop their understanding of the content of the course and transfer their understanding to design a constructivist learning environment in a topic relevant to their fields of practice. The supporting evidence from this study is that students used previous assignments they had performed in other courses to build the final project for this course, EDIT 730.

5. It showed the need to build digital repositories for all course assignments and create a connected community for OER use and creation. This outcome is a consequence of the idea of threading across assignments: there is a need for a platform or database of all course assignments within the institution, so students could return to their previous assignments to build upon them in different courses. In addition, the findings of this study underline that one of the challenges that hinder educators and students from engaging effectively in the 5Rs practices is their need for a conveniently accessible open repository to promote active participation in repurposing and creating OER. Moreover, to empower the sharing of teaching resources under an open license, the results of this study suggest building an open database or a repository for educators at the university. This result seems to align with building a connected community that promotes a participatory culture where professionals connect to each other and collaborate in a meaningful way to share ideas (Cronin, 2017; Biswas-Diener and Jhangiani; 2017; Hegarty, 2015).

Finalized refined OER design principles and their implementation in EDIT

730. The purpose of the Enactment Phase was to generate design principles to inform the design of the OER intervention prototype in EDIT 730. Thus, design principles were generated from state-of-the-art knowledge and empirical studies that were conducted in the Informed Exploration Phase, in which the initial theoretical conjectures were generated. The OER design principles were refined based on data gleaned from the Enactment Phase; they were further refined based on data obtained from the Local Impact Evaluation Phase (Bannan, 2007; McKenny & Reeves, 2012; Plomp, 2007). These generated OER design principles are a heuristic guide for faculty in higher education on how to integrate OER use and creation into their courses. Consequently, this study has identified nine finalized OER design principles (theoretical statements; Plomp, 2007).

This is a list of the finalized refined OER design principles. Following the list is a discussion of each OER design principle, including how the principle was implemented in EDIT 730 for this study.

1. To support the use and creation of OER, OER should be integrated into a course that is designed based on a learner-centered pedagogical model using the principles of a constructivist approach to teaching.

2. OER should be embedded as a main component of the pedagogy of a course.

3. OER integration into a course should support the use and creation of open content under an open license using effective and efficient OER databases.

4. An in-person session should be used early in the course to introduce the OER term, related attributes, its operationalization, threading across assignments, and the benefits from engaging in OER use and creation.

5. The goals of integrating OER into a college course should focus on making students knowledgeable about the term "open educational resources" and related concepts:

    - understanding the term "open educational resources" and the concept behind it,

    - understanding copyright information, including fair use, public domain, different types of CC licenses, and university ownership of copyright

    - identifying OER repositories, and

    - understanding the process and intention of the 5Rs.

6. Students should have the option to share their assignments under an open license and to select the appropriate license.

7. The instructor should provide a collection of OER content as a starting point for embedding the 5Rs practices in a course curriculum.

8. OER content that is shared openly online should be reusable and end in a meaningful purpose for learning.

9. Creating OER content is more effective through collaborative work between both faculty and students.

1. <u>To support the use and creation of OER, OER should be integrated into a course that is designed based on a learner-centered pedagogical model using the principles of a constructivist approach to teaching</u>. To aid the shift to OEP, this study's conclusion emphasizes that a core design principle for integrating OER into a college course is to design the course using learner-centered pedagogical models with constructivist approaches to teaching (DeRosa & Robison, 2017; Ehlers, 2011; Geser, 2012; Hegarty, 2015; Hogan, Carlson, & Kirk, 2015, Jung et al., 2017; Masterman, 2015; Wiley, 2017).

<u>Implementation</u>: The results of this current study show that the current pedagogy the instructor used in teaching EDIT 730 is a very learner-centered, semi-constructivist approach to teaching and is situated at a medium level based on Ehlers' matrix of openness (Ehlers, 2011). Therefore, this course redesign with OER integration did not require a shift in the pedagogy approach. This result contributes to our understanding of integrating OER use and creation into learner-centered pedagogical models where learners are active participants in the learning process and engage in constructivist assignments that end in useful, reusable, meaningful products. Thus, other instructors and students can use them and build on them. These results further support the theoretical foundation for shifting from using OER as open content to open educational practices (DeRosa & Robison, 2017; Ehlers, 2011; Geser, 2012; Hegarty, 2015; Hogan, Carlson, & Kirk, 2015; Masterman, 2015; Wiley, 2017). In addition, these results corroborate the findings of a great deal of previous work investigating whether the use of OER entailed a radical change in current pedagogy practices. Masterman (2015) found that using OER in

courses that are designed based on a learner-centered approach had no impact on changing the current pedagogy. Since the Advanced Instructional Design course provides a semi-open learning environment, it supports both the use and the creation of OER. Thus, if the pedagogy of the course were behaviorist, it would not support the reuse and creation of OER, since OER materials would be used in their original form rather than engaging students in the 5Rs practices. Thus, the findings of this study suggest that when integrating OER into a course designed based on the behaviorist approach to teaching, the pedagogy of the course needs to change to support engaging students in the use and creation of OER.

2. OER should be embedded as a main component of the pedagogy of a course. Another core design principle for integrating OER into a college course is to embed OER as a part of the pedagogy of the course curriculum instead of only adding it as an optional task for students (DeRosa & Robison, 2017; Ehlers, 2011; Geser, 2012). It is important to note that at this early stage of integrating OER use and creation into the course design, there were no case studies or guidelines available on which to base the course design (Paskevicius & Irvine, 2019; Pitt, 2015). As a result, integrating OER as a main component of the course curriculum will make it an essential task within the course assignments.

Implementation: In this study, OER use and creation were embedded in the syllabus of the Advanced Instructional Design course. Specifically, the OER integration was confined to restructuring the instructions of the main course assignments to achieve the desired results: to improve the use of OER beyond providing access to this open

content, and to encourage students to become co-producers of OER content. The results of this study show that there were no changes in the instructions of the main assignments per se; the change was to add instructions and guidance to the current instructions to direct students to the use and creation of OER including the 5Rs.

3. <u>OER integration into a course should support the use and creation of open content under an open license using effective and efficient OER databases</u>. Since the pedagogy of EDIT 730 is a learner-centered, semi-constructivist approach to teaching, integrating OER into this course supported the use and creation of OER. The significant idea that emerged from integrating the 5Rs into the course syllabus was "threading across assignments", which encourages students to build resources upon one another.

<u>Implementation</u>: In this study, students were engaged in different activities of the 5Rs to repurpose the renewable assignments of previous students that were uploaded to MERLOT and make their constructivist assignments available under a CC license. Students were encouraged to make connection between the knowledge within the course by using the previous assignments to build the next assignments. The finding of this study reveals that threading across assignments can influence the pedagogy of courses by encouraging instructors to generate new strategies of teaching and learning to enhance students' learning. This result further supports the idea of Perrow (2017) in connecting online and in-person learning through a crossover protocol to strengthen learning across two modalities of blended and face-to-face college courses. Perrow (2017) stated that the crossover protocol helps instructors to structure the communication between online and in-person learning in several ways (e.g., talking, asking probing questions, and

synthesizing). The outcome of this protocol led to deeper learning and making

connections among ideas, and it fostered an unexpected change in conceptual

understanding by individuals and groups. Similarly, this finding of threading across

assignments within a course is consistent with that of Srinivasan (2019), who called for

creating links between classes, modules, and course assignments to tie together

everything students learn into a meaningful purpose. Srinivasan (2019) asserted that

students want to get benefits from doing the course assignments as well as to be informed

about the purpose of putting several assignments in a particular sequence. In this course,

EDIT 730, the instructor has used connections of knowledge across the online and in-

class activities (Figure 34), but the focus of OER intervention at this stage was only on

the three main assignments. Nevertheless, integrating OER into this course catalyzed

thinking about connections across the assignments within the course and across

assignments in all classes in the IDT program. This result is consistent with one of the

eleven hypotheses that stand as principles of OER: the use of OER fosters educators to

critically reflect on their pedagogy for improving the practices of teaching (Weller et al.,

2017). Finally, the findings related to making connections between knowledge across

assignments within the course and across classes shed light on the importance of creating

a database within the university to host students' work and make it easily available to

instructors in a single place. Then, students could come back to build on their work for

different classes and have an opportunity to publish it online under an open license, and

the instructor could use it in future classes without seeking permission from the creators,

the earlier students. This conclusion further supports Wiley's (2013) point about making

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students' assignments in a certain class publishable content under an open license instead of keeping them in private spaces without adding value to the world of knowledge.
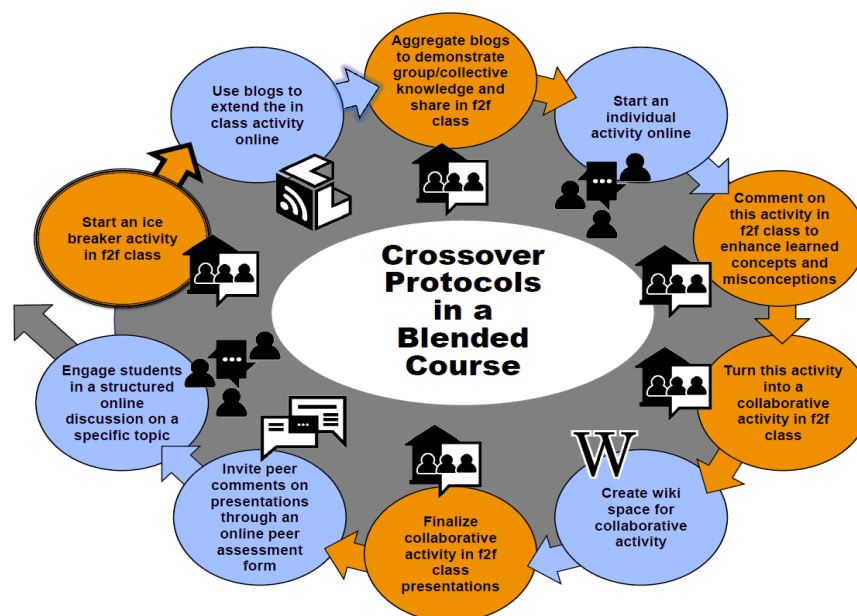
Figure 34. Case study of connecting online and in-class discussion in EDIT 730 developed by Dabbagh, N. (2018). Presented by Dabbagh, N. (2018) at the World Conference on E-Learning 2019, November 4-7, New Orleans, Louisiana.

Furthermore, the integration of the 5Rs into the instructions and guidelines of the main assignments of EDIT 730 identifies how each R is applied in these guidelines (Table 17). "Retain" and "Reuse" can be used interchangeably as a means of using content exactly as it is while protecting authorship of the work. Students in EDIT 730

looked at the previous students' assignments in MERLOT as examples and cited the ones they used. "Revise" was implemented by promoting students to provide comments for the original authors of renewable assignments in MERLOT. This revising practice aimed only to comment in MERLOT without making any adaptation or modification to the original content. It was assumed that the original authors would receive email notifications about the comments, revisit their work in MERLOT, and benefit from the comments to improve their work. "Remix" was the profound R in the 5Rs practices in the main assignments' guidelines. The remix practice was apparent in the idea of threading across assignments, which promoted students to incorporate the components of previous assignments within the course and across the IDT program to build the next assignment. "Redistribute" was implemented by encouraging students to publish their original or mixed assignments under an open license in MERLOT and OER Commons. Consequently, this study has raised an important suggestion about the necessity of developing a digital repository with advanced features to actively manage the workflow of OER content used in the 5Rs for repurposing, creating, and improving the quality of existing OER content.

Table 17

The 5Rs Projection in the main assignments' instructions and guidelines

5Rs Practices	How the Rs were implemented in EDIT 730
Retain Reuse	• Reuse the previous renewable assignments in MERLOT and WordPress as examples of the three main assignments or to cite them. • Use open-access articles related to the selected model for the research brief.
Revise	• Select one example of a CLE presentation by previous students that was published in MERLOT under CC license, and critique the selected example based on the criteria of the assignment.
Remix	• Use the CLE examples selected for the first assignment or the learning design problem shared in the discussion forum to create a scenario for the research-brief assignment or visit research briefs in MERLOT and WordPress from previous students that are under CC license, to build on them. • Use the learning design problem shared in the discussion forum or the components of the real assignment of the research brief to design a proposal and design table for a TSCLE.
Redistribute	• Optional: Share the assignments developed in this course under an open license in OER repositories.

4. <u>An in-person session should be used early in the course to introduce the OER term, related attributes, its operationalization, threading across assignments, and the benefits from engaging in OER use and creation</u>. It is critical to introduce the concept of OER, the benefits, and threading across assignments through face-to-face sessions throughout the semester. That is, it is necessary to have students learn about related

attributes of OER such as the CC license, the different types of CC license, and how to select and add the license to their work. In addition, it important to learn about different OER repositories in different disciplines. In this way, students will assimilate the concept and value behind OER from the beginning of the semester, and they will use OER in work field beyond the classroom.

Implementation: The concept of OER was introduced to students in EDIT 730 through posting a narrated presentation on the course site at the beginning of the semester. The findings of this study showed that this was not enough to educate students about the concept behind OER and the 5Rs framework; students did not understand the concepts behind OER until the end of the course. As a result, this study suggests providing in-person sessions early in the semester to introduce students to these concepts. Subsequent lectures should be conducted throughout the semester to discuss the implementation process of the 5Rs with students and clarify areas of misunderstanding. In addition, the content of this course is very intense; there are many different activities and assignments that require students' attention. Thus, learning and applying the concept of OER in their assignments was considered an extra, time-consuming task. Regarding the implications of threading across assignments within the course, the results of this study showed that 75% of the students adapted their assignments from previous courses in the IDT program to build the final project in this class. Thus, in future classes, the idea of threading across assignments should also be introduced to students early in the semester along with the concept of OER. Thus, students can think about connecting the assignments from the beginning of the class.

5. <u>The goals of integrating OER into a college course should focus on making students knowledgeable about the term "open educational resources" and related concepts</u>. The findings of this study provide insights into two fundamental goals for integrating OER into EDIT 730: to educate students to become knowledgeable about OER and its related concepts, and to encourage students to become co-producers of OER. Consequently, making students aware of OER and associated attributes will support students to build on existing knowledge to contribute to continuous improvement of OER content in relevant fields, and to involve OER in scholarly work. Together, these results foster sustainability in the development of OER materials.

<u>Implementation:</u> An intervention section was created in the course LMS that educated students about the concept of OER and related concepts as well as provided instructions that helped students execute the activities related to OER use and creation as well as the 5Rs.

6. <u>Students should have the option to share their assignments under an open license and to select the appropriate license</u>. This study reveals another important element to consider in integrating OER into courses: sharing OER under an open license must be optional for students. In addition, students must have the freedom to select the appropriate CC license for their assignments. As a result, students will comprehend the benefits and concepts behind OER and its related attributes, and students will value their engagement in scholarly publication works in terms of sharing their assignments online under an open license, improving the existing OER materials, exchanging ideas, and learning from each other. These results are in agreement with those obtained recently by

Paskevicius and Irvine (2019), in that OEP tended to encourage learners to use the

opportunities provided (e.g., affordance of technology tools and resources) to engage

openly and directly in open teaching and learning practices and in creating artifacts that

can be shared openly in public.

Implementation: This study strengthens the idea of sharing teaching resources

under a CC license to build upon them or to repurpose them, along with sharing students'

work under an open license. This finding suggests that educators would be able to use

lesson plans to build activities on these teaching resources and to exchange best practices

and ideas on teaching strategies. As a result, building on existing resources supports

continual knowledge construction in OER in different areas. This result supports the need

to build an open database among educators within the organization. Creating an open

environment supports creating a participatory culture among educators within the

university to connect to each other, exchange ideas of teaching strategies, and collaborate

in a meaningful way (Hegarty, 2015).

In addition, the findings of this study reflect students' interest in sharing their

assignments online after they could address the instructors' comments to make the

assignments good quality. This finding revealed a promising result in that students in this

class consider publishing high-quality work for others to use that would contribute to

enhancing the quality of OER in the Instructional Design discipline and raise widespread

use of OER across higher education institutions. Kelly (2014) insisted that the low quality

of existing OER is considered an obstacle that hinders the diffusion of OER across

institutions of higher education. Accordingly, as the OER movement moves forward,

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peer-reviewed content will encourage others to repurpose it for the purpose of benefit and development in a wide range of ways. In addition, this study found that students did not put time into optional activities when their time was needed on required activities and assignments. Only two students published their assignments under a CC license at the end of the course.

7. <u>The instructor should provide a collection of OER content as a starting point for embedding the 5Rs practices in a course curriculum</u>. The main 5Rs activities were embedded in the instructions of the three main assignments: reuse and critique existing renewable assignments for previous students that are shared under CC license in MERLOT; use the components of previous assignments to build the next assignment; and share the assignments under a CC license (optional). Thus, it is critical to have a base of OER content in open databases (e.g., renewable assignments) that will support instructors who are attempting to embed the 5Rs in the course curriculum.

<u>Implementation</u>: Students enrolled in this course had a collection of OER renewable assignments for students from previous classes (Fall 2017, Spring 2018, and Spring 2019) as a base for practicing the 5Rs activities. The previous students gave permission to make their assignments available under a CC license. These OER renewable assignments are published online in MERLOT and WordPress.

8. <u>OER content that is shared openly online should be reusable and end in a meaningful purpose for learning</u>. This study shows that engaging students in the OER use and creation in the course assignments should end in products that can be published online and used by others in different ways. Therefore, OER that are shared openly online

should be reusable and useful to be used by educators and students around the world for educational purposes.

Implementation: The Advanced Instructional Design course is designed to provide students skills and knowledge for designing constructivist learning environments using a variety of pedagogical models and instructional strategies. In this study, students were engaged in executing constructivist assignments through both individual and collaborative projects. In the first assignment, students created a presentation of an example of a constructivist learning environment with a description of how will this example represents the characteristics of constructivism. The presentations can be used by other educators as assignment examples or lectures to teach their classes about constructivism principles. Students in the second assignment created a research brief paper about a constructivist -based pedagogical model or an instructional strategy or a problem type. The final product can be published in open-access journals. Students in the third assignment developed a proposal for designing a Technology-Supported Constructivist Learning Environment, a design table, and a prototype. Students can release their assignments as free and open products, so that other educators and students can use them as assignment examples, repurpose them and build on them. This result corroborates the ideas of Jhangiani (2017), who asked his students to write multiple-choice questions instead of only answering them to support his open textbook in Social Psychology; this assignment led to students writing 1400 questions in a period of 10 weeks.

9. <u>Creating OER content is more effective through collaborative work between both faculty and students</u>. The findings of this study suggest that engaging students in collaborative work to improve CC products would be more effective for creating and repurposing OER materials. That is a way to improve the quality of OER content where students and educators can exchange ideas to improve the work and be involved in publication processes.

<u>Implementation</u>: In this study, students worked collaboratively and individually in performing the assignments and projects of the course. They worked in groups in the Wiki space; thus, they learned from each other and provided constructivist feedback on their learning (Hogan et al., 2015; Jung, Bauer, & Heaps, 2017). In the end, students' work can be published online under an open license. The study's suggestion seems to be in line with DeRosa and Robison's (2017) emphasis on updating outdated artifacts on the web through growing collaborative space where new ideas are always developing. Nevertheless, long-period investigation is needed to provide further evidence. The findings of this study also shed light on the importance of creating a shared community for faculty to collaborate on best practices of teaching strategies and assignment examples. These findings further support the intention of openness to promote creativity in improving existing OER or creating new OER materials (Biswas-Diener & Jhangiani, 2017; Koseoglu & Bozkurt, 2018).

Conclusion

This design-based research study set out to design an OER intervention in a college course to promote OEP. This dissertation study has shown that OER should be

integrated into courses that are designed based on learner-centered pedagogical models where learners are active participants in the learning process and engaging in constructivist assignments that lead to useful, reusable, and meaningful products. The evidence of this study shows that integrating OER into EDIT 730 did not change the current pedagogy of the course, but it did contribute to change the main assignments' instructions and guidelines in terms of the way the students conducted their assignments. The EDIT 730 course that was selected to test and examine the OER intervention prototype in this dissertation study was learner-centered and designed based on a semi-constructivist approach to teaching. As a result, the pedagogy of the course did not change based on the OER intervention.

This dissertation study provides best practices of the potential of embedding the 5Rs in a course curriculum. The findings suggest that commentary activities helped students to look at examples of previous assignments that are under CC license, create their own assignments, and provide comments to the original assignment authors that confirm the theoretical assumption of students' contribution to continuous improvement of OER content.

One of the more significant findings to emerge from integrating the 5Rs into the instructions of the main assignments is called *threading across assignments*: making connections between assignments within a course as well as between assignments across courses in the entire Instructional Design Program at the research university. The findings suggest that the idea of threading across assignments will support students to connect

knowledge across all courses, gain better understanding of the course content, and apply their understanding to their assignments and projects in the academic program.

This study has found that generally the most important Rs to students were *Remixing* and *Revising*; the students used these 5Rs to construct knowledge by building resources upon one another as a means of supplementing, explaining, and enriching content as well as taking existing educational resources and content from a certain level to the next level for improvement purposes.

This study also found that integrating OER into a course spurs both instructors and students to reflect on the course curriculum. It helps the instructors to reflect on the pedagogy of the course and innovate teaching and learning practices that lead to enhanced student learning. It encourages students to reflect on the trajectory of the course (the content, assignments, and learning activities) that leads to defining areas of improvement, such as making connections between the knowledge they learn within the course.

The findings of this study strengthen the idea of sharing teaching resources under CC license along with students' assignments. As a result, this study emphasizes the importance of building an open database among educators to exchange ideas on teaching and learning in different disciplines and to build on others' pedagogy practices. Likewise, building a database that compiles all students' assignments for all classes for the entire IDT program would encourage students to build on their previous projects and enable instructors to look at all students' assignments in one place.

In terms of the effectiveness and usefulness of the OER intervention, the findings suggest that the intervention contributed to an increase in students' awareness of OER and related concepts. The findings indicate that the instructions and guidelines of the OER intervention that directed students to execute the activities related to OER and the 5Rs were straightforward and easy to use. Furthermore, the findings suggest that integrating OER into a course entails introducing the concept of OER and related attributes with an in-person lecture to classes. Collaborative work is also recommended in integrating OER into a course. Moreover, it is critical to have a base of OER content (e.g., renewable assignments) that will support instructors to embed the 5Rs in the course curriculum and to introduce students to the university's ownership of copyright.

This dissertation study found that there are several obstacles hindering the advancement of the OER movement. One of these obstacles is the lack of support from the top management at institutions of higher education, which results in the absence of a policy regarding faculty and student engagement in OER use and creation. Another obstacle is that the benefits that will accrue to faculty and students from their OER use and creation are still unclear, which hinders educators and students from sharing work under a CC license. In addition, the infrastructures that support creating a vibrant community of sharing, revising, and remixing OER are available, but they are not efficient for creating an active community for OER use and creation. Thus, the findings of this study suggest that there is a need to establish a system that efficiently encourages students to engage effectively in creating, revising, remixing, and sharing their assignments under a CC license. Finally, the findings suggest the need for more specific

guidelines, examples of best practice, and training on how to integrate OER and the 5Rs into a course curriculum.

Implications

This section discusses the implications of this dissertation study and then proposes the new OER design principles that emerged from this study.

This dissertation study contributes to addressing the controversial topic among OER advocates that is concerned with the lack of evidence about the effectiveness of OER use in teaching and learning practices in higher education. Particularly, it provides body-of-knowledge empirical evidence about the potential of OER to change the current pedagogy of a course and innovate new approaches to teaching and learning. The evidence obtained in this dissertation study sheds light on the pedagogy approaches that are compatible with integrating OER beyond only providing access to open and free materials: the learner-centered pedagogical models using constructivist approaches of teaching that are confirmed through this study. Consequently, for the organization or faculty who want to infuse OER use and creation into their courses, they must shift to learner-centric courses in a constructivist learning environment, with course-related assignments and activities designed accordingly for the targeted users. The insights gained from this study offer educators guidance and best practices for integrating OER into a college course curriculum: what to change in the pedagogy, and how the 5Rs can be integrated into course assignments and learning activities. The OER design principles developed in this study contribute to a theoretical understanding of the essential components of a course design based on OER use and creation. This study also discusses

the considerations needed to shift to opening teaching and learning practices with the use of OER beyond accessibility.

The design principles and OER intervention prototype that resulted from this dissertation study carry rich information that informs educators who are designing a similar intervention in similar contexts with a specific target population (Nieveen, 2007). The design-based research approach of this dissertation study provides rigorous results by using rigorous research methods in iterative cycles of design and development, collaborating with practitioners and experts. Since this intervention was undertaken through a formative evaluation in an authentic setting, EDIT 730, these iterative procedures result in valid and reliable design principles (Plomp, 2007). To support faculty who want to integrate OER into their courses, instructional designers can use these generated design principles to design the course curriculum and structure the guidelines of the course assignments and learning activities.

This dissertation study provides insights into the intentions of the 5Rs (retain, revise, remix, reuse, and redistribute) and offers new data and unique strategies for implementing the 5Rs in a college course. This study offers instructional designers insight into how they can integrate the 5Rs into the instructions for course assignments by connecting knowledge across assignments both within a course and across all courses in an academic program. Embedding the 5Rs in courses encourages the course instructors to reflect on their current pedagogy and instructional materials, leading to innovation in their teaching and learning practices. These reflective practices can lead to thinking about better sequencing of the assignments and learning activities within a course. As a result,

students will end the course having mastered knowledge with applications, which will enable them to transfer what they have learned to other contexts in related fields. Together, these results contribute to filling the theory-practice gap in the implementation of the 5Rs in a course, and these results confirm the importance of providing best practices and evidence regarding users' practices of the 5Rs framework in using OER (Bliss & Smith, 2017; Wiley et al., 2014).

This study enhances our understanding of the definitions and intentions behind open pedagogy and open educational practices. Together, the definitions of open pedagogy and OEP support faculty innovation of pedagogical models and new teaching strategies that engage students in the 5Rs.

This study's data sheds light on ways to leverage the huge investments in the OER movement, to achieve the potential benefits of this phenomenon for improving the quality of education (DeBarger, 2019). Several similar research studies that recently examined different areas in the domain of OER are in alignment with several findings of this study. First, the main goal for any OER projects and initiatives is to start with educating users (faculty and learners) about the term OER and the concept behind this open and free content as well as the associated attributes (different types of CC licenses, the 5Rs framework, types of open licenses, university ownership of copyright) (Paskevicius & Irvine, 2019; Zhang & Li, 2017). Second, the pedagogical models that should be used to improve the use of OER beyond accessibility need to shift courses toward learner-centric (DeRosa & Robison, 2017; Ehlers, 2011; Geser, 2012; Hegarty, 2015; Hogan, Carlson, & Kirk, 2015, Jung et al., 2017; Masterman, 2015; Wiley, 2017). Third, best practices and unique ideas were generated in this study regarding the benefits of OER in delivering greater learning efficiency, promoting

continuous improvement of instructions, and innovating pedagogy practices. The students'
and instructor's perspectives of threading across assignments for connecting the knowledge
and students' understanding across the assignments within the course and across an entire
program align with those advocated by Perrow (2017) and Srinivasan (2019).

Emerging OER Design Principles

The theoretical yield of the cyclical process of exploration, development, design, and
evaluation of this dissertation study is used to inform new design principles. As a result,
the findings of this study provide the basis to generate these new heuristic OER design
principles (intervention theory):

- Finding: The most important values of OER are promoting shareability,
  equalizing access to content for all, cost reduction, publication credits, and
  personalization.
    - New design principle: OER increases the opportunities for shareability,
      access, flexibility, publication credits, and personalization.
- Finding: It is important to make connections between learning activities and
  assignments within this class (EDIT 730) as well as across assignments for the
  entire IDT program.
    - New design principle: Integrating OER use and creation provides
      opportunities to make connections between successive modules and
      between assignments, and build new work based on previous work.
- Finding: Students are interested in publishing their assignments under CC license
  after addressing the instructors' comments.

- o New design principle: Engaging students in OER use and creation

    increases opportunities for sharing peer-reviewed open content.

- Finding: The ideal way to value OER would be to remix existing open materials

    for executing assignments, such as a class project, that would become a resource

    built over semesters.

    - o New design principle: Engaging students in the 5Rs practices increases the

        opportunity to value personal work and build on it over semesters.

- Finding: Sharing teaching resources is a more practical way to build on and

    repurpose them.

    - o New design principle: Sharing resources under an open license provides

        benefits for sharing teaching resources to be remixed and built upon by

        others.

Recommendations and Future Research Directions

There are several recommendations raised from this dissertation study. First, at the macro level, successful achievement in using OER beyond merely providing access to open content on the Internet, the top management in any institution must embrace the philosophy and paradigm of OER and develop a policy of OER use and creation. The road map of the use of OER in these institutions should be clear. Institutional policy must be clear about the university's ownership of copyright for teaching resources and students' assignments as well the benefits faculty and students will get from engaging in the use and creation of OER. Furthermore, the top management of institutions adopting the use and creation of OER needs to establish logistic support for OER integration, such

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as providing supported infrastructure, providing support from instructional designers, and establishing an introductory-oriented program to educate students and faculty about the concept of OER. It is imperative to spread the idea of reusing and creating OER among faculty and students across the institution's campuses. The institution may make it a mandated requirement for all students enrolled in the university that students must complete in their first enrollment year.

Second, at the micro level, faculty should move their courses toward learner-centered pedagogical models using a constructivist approach of teaching. That is, courses using lectures and exams that are based on a behaviorist approach of teaching do not support the 5Rs framework. OER use and creation should be integrated as a part of the pedagogy of a particular course that leads to restructure the assignments and learning activities toward repurposing and creating OER. Another recommendation suggested from this dissertation study is to develop a better system to create a vibrant connected community for sharing and repurposing OER and track the citations of OER resources that are shared and published by educators and students under an open license. Developing advanced features for an open repository that is more advanced than MERLOT will encourage users to share their work under CC licenses. However, with the current systems, there are no crowded and busiest uses of existing OER resources.

In addition, faculty need more specific guidelines than those generated from this dissertation study. Best practice examples and training on how to repurpose OER by using the 5Rs in a course curriculum are recommended. These guidelines and best practice examples can be developed by selecting a course based on a behaviorist

approach to teaching. The generated design principles from this dissertation study will be used to integrate OER use and creation into the selected behaviorist course curriculum. The course will be shifted to a learner-centric approach; the instructional materials will be developed toward accomplishing the outcome of the course, and the 5Rs will be embedded and integrated into the instructions of the course assignments and activities. These practices will add new directions and guidelines to the ones generated from this study, will refine and validate the design principles, and will provide additional best practices of course design with OER. Furthermore, students need examples of case studies of the iteration of revising and remixing activities with the existing assignments under open license, to encourage students to think of the process and understand how they build on existing knowledge.

Furthermore, an in-person lecture and presentation is recommended. A lecture introducing OER and the associated concepts should be presented to classes in situ. A narrated presentation is not enough to make students know about OER and its implications in the education sector. For the online classes, a synchronous lecture should be delivered at the beginning of the semester. Subsequent lectures should be conducted throughout the semester to discuss the implementation process of the 5Rs with students and clarify areas of misunderstanding. The instructions and guidelines that direct students to perform the activities related to the 5Rs and OER creation must be clear and straightforward.

Based on the findings of this dissertation study, these are recommended as possible areas for future research:

1. Select different courses in different institutions of higher education to test the OER intervention prototype. The courses selected can have different delivery modes (online, face-to-face, and hybrid) and be designed based on different pedagogical models. These applications will enhance and validate the evidence obtained from this dissertation study.

2. Conduct a longitudinal study across two years to examine the effectiveness of threading across assignments on students' learning and explore the significant intentions, meaning, and differences between each R in the 5Rs. In addition, it is critical to examine if students' practice of the 5Rs will improve their learning.

3. Explore the benefits to students from engaging in repurposing and creating OER. The benefit that is commonly believed at this point are portfolio building and getting publication credit for work published under a CC license. However, this benefit appears not to be sufficiently motivating to share work online under an open license.

4. Explore the motivational factors that might encourage students to repurpose previous students' assignments and to create new OER materials.

5. Conduct a research study using User-Experience (UX) Design to design an open repository for creating a vibrant community and an active open learning environment for students and faculty to facilitate repurposing creating, and sharing OER online under an open license. As a result, authors can see the number of citations, revisions, and remixes, and address comments to improve

the work. This UX design cannot happen without studying in depth the system requirements from the users' and practitioners' perspectives.

Limitations

This design-based research study has several limitations that might affect the rigor of the findings. First, there was a short time frame for testing the OER intervention with respect to use and creation by the potential participants. It was set up to expose students to the intervention for only one semester (August 27-December 10). However, engaging students in the use and creation of OER entails a long period of tracking students' OER-published works in terms of citing, revising, remixing, and commenting; testing this intervention over a short time is insufficient. In addition, the OER intervention is an evolutionary prototype that required a long period of iterative development, evaluation, and revision (Nieveen, 2007). These multiple evaluations and refinements of the intervention prototype contributed to maximizing the design of the course-enabled OER use and creation, enhanced the quality of the design principles, and advanced the theory regarding the impact of OER in promoting a continuous improvement in pedagogy practices. However, the DBR is characterized by an intervention that was used to test the potential benefits of OER in innovative pedagogy practices of a course in an authentic setting, which enhances the validity of the findings of this dissertation study (Maxwell, 2013; Plomp, 2007).

Second, the study uses self-reported methods (survey, focus group, and interview), which might affect the validity of the study, since these methods are subjective. However, the formative evaluation was conducted to reveal participants'

thoughts and attitudes toward the design principles in supporting the integration of OER at a high level of openness in teaching and learning practices and their perceptions according to their own experiences with the intervention in a real-world setting in EDIT 730. Accordingly, based on the participants' perspectives, the OER intervention was improved (Nieveen, 2007). In addition, using multiple research methods with different users enhances the validity of the conclusions of this study. Besides, in the post-dissertation phase, a summative evaluation will be conducted in other contexts to gain further evidence of the effectiveness of the OER intervention in the teaching and learning of a course (Nieveen, 2007).

Third, the scope of this study is limited due to the limited number of students who enrolled in EDIT 730; there were only eight participants. Only one course was selected as a research site, based on the need for convenient access to the participants. Examining the inferences of this dissertation study will be through conducting a broader-impact evaluation (a summative evaluation) as a post-dissertation study in other contexts in order to generalize the findings (Maxwell, 2013). However, a rich description of the course, procedures, and data collection and analysis can overcome this deficiency and enhance the validity of findings.

Fourth, one of the targeted participants in the study was the instructor of the course and also the researcher's advisor, collaboratively working on examining the new direction in the OER movement. So the influence of the instructor on individuals' performance becomes another limitation of the study. Thus, it is critical to deal with the plausible threat of the impact of authority and power that could influence the results of

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the study. In this dissertation study, the idea of OER use and creation was integrated into the syllabus of the course. That means this new concept was being an integral part of the learning activities and assignments, and students were exposed to it as part of the core instruction in the course instead of testing it as voluntary activities. In addition, students' assignments and activities including the 5Rs were assessed using rigorous rubrics. Thus, the authority of the instructor was minimized in this study.

Research Validity

The concept of the quality of a research study has been controversial in educational research. It is a dilemma, as Anfara, Brown, and Mangione (2002) described it. Quality has also been referred to by different terms, such as *trustworthiness*, *validity*, and *authenticity* (Maxwell, 2013). Therefore, it is important for a researcher to find a way through the maze of conflicting positions regarding the quality of MM research. For example, according to Seale's (1999) criteriologists, the debate about quality criteria involved two terms, *validity* and *reliability*, to symbolize an interpretivist belief in judging the quality of a qualitative study. In addition, several researchers (Glesne, 2016; Harrison & MacGibbon, 2001) use the term *trustworthiness* to judge the quality of a research study. For Glesne (2016), trustworthiness means that the criteria can be used to evaluate the quality and rigor of the study. Harrison and MacGibbon (2001) use *trustworthiness* to refer to the strategies we use to meet the criteria of validity, credibility, and believability of the research. Likewise, Lincoln and Guba (1985) argued that using the term *validity* with interpretivist inquiry was inappropriate; they asserted that *trustworthiness* was a better term and proposed certain techniques such as credibility,

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transferability, dependability, and confirmability. In this paper, the researcher used the term *validity* developed by Maxwell (2013), and implemented other techniques from different scholars that fit with the validity threats of the study.

To test the validity of a study, it requires the ability to test and verify its conclusion (Seale, 1999). For Maxwell (2013), the validity of a study should be proved by providing plausible alternative explanations and answering questions such as "How will we know that the conclusion is valid?" and "Why should we believe it?" He also described validity as relative, meaning it must be evaluated in relation to the purpose and questions of the research rather than depending on the conclusion of the study. Creswell and Miller (2000) used the term *validity* to refer to the extent to which participants' realities are represented accurately and credibly. Validity strategies are used to verify the inferences drawn from the data rather than from the methods (Creswell & Miller, 2000; Maxwell, 2013). In order for researchers to judge the validity of the conclusions of their studies, they are required to think about the validity threats to their work, which are the key concept in validity that explains the strategies researchers have used to deal with plausible existing threats.

Consequently, in order to judge the validity of the conclusions of this study, the researcher has stated the assumptions of validity threats that might affect the credibility of the study. The possible validity threats to this study are discussed from qualitative strands and quantitative strands separately in the following sections.

Qualitative validity threats. The first qualitative validity strategies used were the rich data and respondent validation. Maxwell (2013) stated that intensive interviews

enable the researcher to collect rich data that can be enough to capture and answer the research questions. Because the concepts of renewable assignments and engaging students in OER use and creation are emergent in the OER movement and a topic of discussion recently, the instructor was likely to be neutral regarding this controversial concept. Hence, using intensive and in-depth semi-structured interviews can deal with the skepticism. To achieve the reality, an interaction between the investigator and the object must occur, so findings were created through an ongoing process of investigation (Guba & Lincoln, 1994). Probing and asking in-depth questions cultivated understanding of the impact of the intervention on existing teaching and learning practices and areas needing improvement in the design of the intervention. Thus, the researcher excluded all her beliefs regarding OER use and creation and stayed open to other possibilities based on the instructor's conceptions, from both negative and positive perspectives. Furthermore, students' responses to the survey as well as the focus group discussion were considered additional information to advance the conclusions of the study; students' responses were reported based on the students' perspectives for both negative and positive perceptions. Another validity strategy used was respondent validation, which refers to member checks on how data collected from participants corresponds with the conclusions of the study (Maxwell, 2013). Thus, a brief summary of study results was shared with the participants to confirm their interpretation and help avoid misinterpretation of their responses and perspectives.

Triangulation was also used to maximize the validity of this dissertation study. Triangulation refers to the multiplism in which a researcher can dive into understanding

alternative aspects of an issue (Cain & Finch, 1981). For Creswell and Miller (2000), triangulation is a process of validity used by researchers to associate information among multiple sources of data to generate themes and remove overlapping data to represent the results of a study. Greene, Caracelli, and Graham (1989) stated that multiplism is used to enhance the inquiry result, and Maxwell (2011) insisted that researchers need to be aware of ensuring "coherence" when combining multiple methods that can be used to study a phenomenon. McKinney and Reeves (2012) pointed out that using multiple methods to study a phenomenon within a complex system in a real-world context enhances the "ecological validity" (p. 8). However, Maxwell (2013) argued that triangulation should be considered to deal with validity threats by making evidence instead of referring to the methods. Guest (2012) asserted that examining a research problem with multiple data sources is considered a robust activity that helps support the validity of the study. This dissertation study is inherently triangulated by integrating qualitative and quantitative methods in data collection, data analysis, and generating the meta-inferences of the study. Based on Maxwell's (2013) view of triangulation, integrating results from: Enactment Phase using the focus group, one-on-one interview, expert reviews, designer reflection, and artifact analysis; and Local Impact Evaluation Phase using the focus group, intensive interview, open-ended and closed-ended survey questionnaires, and artifact analysis complemented the conclusions of the study based fully on participants' perspectives of reality. The merged conclusion was the evidence base of this study, since the results of each method corresponded to the results of other methods.

An additional validity strategy was used, which is the intervention. Maxwell (2013) stated that the intervention "can be used to develop or test ideas about the group or topic studies" (p. 127). One of the purposes of this study was to test the impact of OER on improving teaching and learning practices in higher education and examine how OER can be integrated into a college course that will manifest in OEP. Testing these ideas was undertaken through designing an OER intervention with respect to use and creation. Since these ideas are recent topics of discussion among OER proponents, testing this intervention with potential participants provided an evidence base about the effectiveness of OER in teaching and learning practices that may or may not support the scholars' claim that OER can contribute to promoting innovative pedagogical models and engaging students in OER creation.

Quantitative validity threats. The quantitative validity of this dissertation study depends on the relationship of conclusions to reality (Maxwell, 2013). The validity threats to the quantitative data resided in using a self-report survey. Hence, the survey was administered after conducting the focus group discussion to help the researcher clarify some of the students' responses through the focus group session, to eliminate the validity threat of bias. The survey questionnaires were developed to measure specific aspects of the OER intervention that related to the effectiveness of the OER intervention in increasing students' awareness of OER and associated attributes; the survey questionnaires also measured the usefulness and usability of the intervention in general. Thus, the validity of the survey was confirmed by proving that it was used to measure what it claimed to examine (Teddlie & Tashakkori, 2009). In addition, the survey

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construct was examined by several users to prove the determining validity measurement

of the survey construct (Teddlie & Tashakkori, 2009). Other validity threats in this study

include the sampling selection and inadequate sample size; reporting the similarity

among participants' responses and generalizing the conclusion based on comparing with

other measures can deal with this threat. Furthermore, for the very precise QUAN

method, the sample must be large and mathematically calculated. Thus, random sampling

with a high population of participants will be conducted in the next phase of this DBR,

the Broad Impact Evaluation Phase, which is not a part of this study. The intervention

will be implemented in several different contexts for generalizability purposes.

The Factors Leading to OER Adoption in Higher Education

The interview sessions will start by providing participants an overview of the purposes of the study and how reflection on their experience is valuable for the study. My goal for this study is to understand the faculty perception of OER in higher education institutions through OER professionals who have been worked closely with faculty in OER adoption in order to determine the factors of adoption and non-adoption OER.

Establish Trust and Rapport
Participant's involvement in OER initiative
1. What is the OER initiative you have been involved in? What was the aim of this initiative?
    1. What was the target discipline?
    2. Who were the target participants in this OER initiative?
    3. How would you describe your essential role in the OER initiative?
        1. How did you approach the target faculty members?
        2. How long did faculty response take?
        3. Did your institutions provide incentives for faculty who involved in the OER initiative?
        4. Did you achieve successful OER adoption? If yes, how would you describe the achievements?

Faculty perception of OER
- How would you describe faculty perception about adopting OER in their courses?
    - What perception does faculty have about open educational resources?
    - What is the potential usefulness of OER do faculty perceive?
    - How would you describe the extent to which faculty understand the use of 5R permissions in adopting OER in their courses?

OER-enabled pedagogy
- How would you describe the value of OER in improving pedagogy approach in teaching courses?
    - How would you describe faculty thoughts on changing teaching practice by using OER in their courses?
    - What do faculty most likely to adopt in their courses in terms of the types of OER content?

- o What is the nature of teaching activities of the course faculty selected for OER adoption?
- o How do faculty use OER materials regarding using it as supplementary or primary resources?
- o How would you describe an effective OER-enabled pedagogy?

Willingness to reuse OER
- How would you describe the willingness of faculty in higher education to reuse OER in their courses?
  - o How do faculty show willing to reuse OER in their courses?
  - o How do faculty show willing to share resources they used in their courses with others?
  - o What factors motive faculty to continue the adoption of OER?
  - o What factors hinder faculty to continue the adoption of OER?

Appendix B

Students Perceptions of Renewable Assignments in Open Educational Resources

Adoption

BASIC DEMOGRAPHIC

The following are general questions related to you and your courses at GMU.

Q1. Select your gender
○ Male
○ Female

Q2. What is the length of your work experience?
○ Less than 1 year
○ 1–2 years
○ 3–4 years
○ 5–6 years
○ 7–8 years
○ 9–10 years
○ More than 10 years

Write your job title_____

Q3. Are you currently a full-time or part-time student in your program?
○ Full-time
○ Part-time

The remaining questions are related specifically to the open educational resources (OER) and the concept of renewable assignments that your instructor used in this course for your class readings and class activities.

Q4. "Open Educational Resources are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools,

materials, or techniques used to support access to knowledge" (William Flora and Hewlett Foundation, 2002). In this course, you have been introduced to OER. To what extent have you become knowledgeable about OER?

- ⭕ Very knowledgeable
- ⭕ knowledgeable
- ⭕ Somewhat knowledgeable
- ⭕ Not knowledgeable

If your response to the previous question was either "Very knowledgeable," "knowledgeable," or "Somewhat knowledgeable," please answer questions 5 and 6.

Q5. What do you think is the most important value of OER? Please, check all that apply
- ⭕ Cutting down the costs of subscriptions and publications
- ⭕ Promoting flexibility and customizability (user can modify, innovate, or reuse OER in specific contexts for any purpose)
- ⭕ Promoting shareability
- ⭕ Contributing to continuous improvement of OER materials because of 5Rs practices
- ⭕ Promoting personalized learning (user selects what he/she wants to learn and how to learn)
- ⭕ Equalizing access to information for all
- ⭕ Enhancing learning performance
- ⭕ I am not sure

Q6. How would you rate the quality of the OER used for this course? (They were found under the assignments, CLE presentation, and research brief.)
- ⭕ WORSE than the quality of the traditional texts in the courses
- ⭕ About the SAME AS the quality of the traditional texts in the courses
- ⭕ BETTER than the quality of the traditional texts in the courses

Q7. Which database(s) do you always use for your own search? Please, check all that apply
- ⭕ Google
- ⭕ Wikipedia
- ⭕ Journal of Online Learning and Teaching (Merlot)
- ⭕ Directory of Open Access Journals (DOAJ)
- ⭕ OER Knowledge Cloud
- ⭕ None

Q8. The renewable assignment is defined as "an artifact that has personal meaning to students and is shared publicly under the open license of creative commons CC-BY."

Please rate your satisfaction regarding the concept of renewable assignments in the course:

Unsatisfied	Somewhat Satisfied	Satisfied	Very Satisfied	Extremely Satisfied
(1)	(2)	(3)	(4)	(5)

Q9. If your response to the previous question was 1, please explain:
If your response to the previous question was either 2, 3, 4, or 5, please answer the following question.

Q10. What are the most important factors that influenced you regarding the renewable assignments? Please, check all that apply
○ Publication credit
○ Intrinsic motivation
○ The pleasure of being involved in peer production
○ Sharing work with others for educational purposes
○ Stimulating innovation
○ Others _____

Q11. Now that you understand the concept behind renewable assignments, are you willing to share your future assignments of other courses with others under an open license?
○ Yes
○ No
○ I am not sure

Explain:_____

Q12. What do you like best about the renewable assignments approach in EDIT 730?
_____
_____

Q13. What do you think are the main barriers that hinder you from publishing your assignments under the creative commons license?
_____
_____

If you would like to participate in future studies in the area of open educational resources, please write your email:_____.

Appendix C

Students' Responses to the Survey

Q1 Select your gender

Answered: 8   Skipped: 0
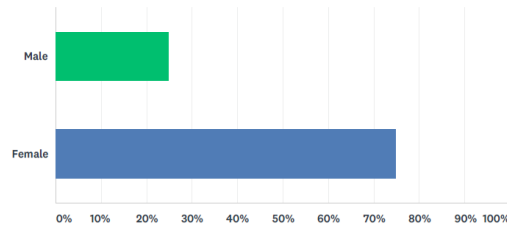
ANSWER CHOICES	RESPONSES	
Male	25.00%	2
Female	75.00%	6
TOTAL		8

Q2 What is the length of your work experience?

Answered: 8   Skipped: 0
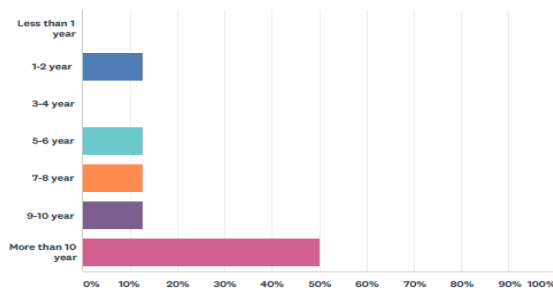
ANSWER CHOICES	RESPONSES	
Less than 1 year	0.00%	0
1-2 year	12.50%	1
3-4 year	0.00%	0
5-6 year	12.50%	1
7-8 year	12.50%	1
9-10 year	12.50%	1
More than 10 year	50.00%	4
TOTAL		8

Q3 Are you currently a full-time or part-time student in your program?

Answered: 8   Skipped: 0
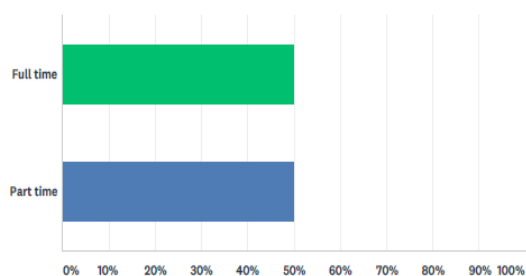
ANSWER CHOICES	RESPONSES	
Full time	50.00%	4
Part time	50.00%	4
TOTAL		8

Q4 "Open Educational Resources are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge" (William Flora and Hewlett Foundation, 2002). In this course, you have been introduced to OER. To what extent have you become knowledgeable about OER?

Answered: 7   Skipped: 1
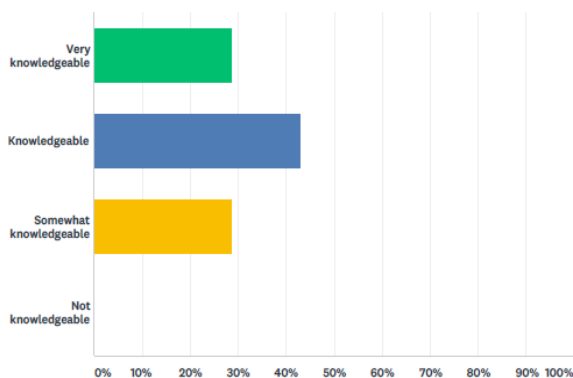
ANSWER CHOICES	RESPONSES	
Very knowledgeable	28.57%	2
Knowledgeable	42.86%	3
Somewhat knowledgeable	28.57%	2
Not knowledgeable	0.00%	0
TOTAL		7

Q5 What do you think is the most important value of OER? Please, check all that apply

Answered: 7   Skipped: 1
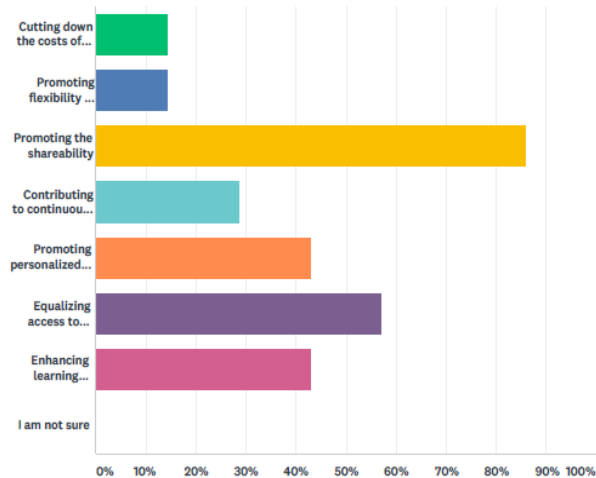
ANSWER CHOICES	RESPONSES	
Cutting down the costs of subscriptions and publications	14.29%	1
Promoting flexibility and customizability (user can modify, innovate, or reuse OER in specific contexts for any purpose)	14.29%	1
Promoting the shareability	85.71%	6
Contributing to continuous improvement of OER materials because of 5Rs practices	28.57%	2
Promoting personalized learning (user selects what he/she wants to learn and how to learn)	42.86%	3
Equalizing access to information for all	57.14%	4
Enhancing learning performance	42.86%	3
I am not sure	0.00%	0
Total Respondents: 7		

Q6 How would you rate the quality of OER used for this course? (They were found under the assignments in Blackboard, CLE presentation and research brief)

Answered: 7   Skipped: 1
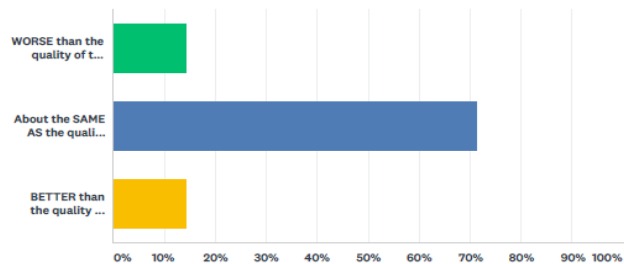
ANSWER CHOICES	RESPONSES	
WORSE than the quality of the traditional texts in EDIT 730	14.29%	1
About the SAME AS the quality of the traditional texts in EDIT 730	71.43%	5
BETTER than the quality of the traditional texts in EDIT 730	14.29%	1
TOTAL		7

Q7 Which database(s) do you always use for your own search? Please, check all that apply

Answered: 7   Skipped: 1
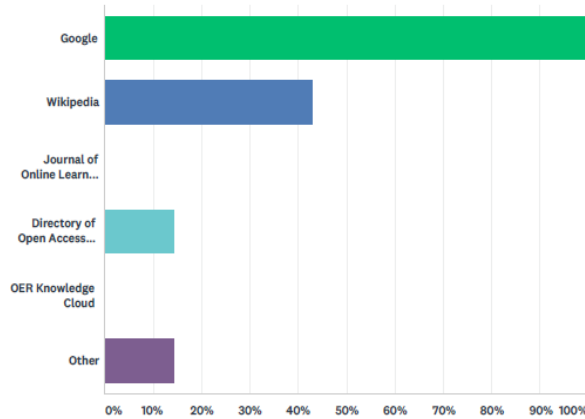
ANSWER CHOICES	RESPONSES	
Google	100.00%	7
Wikipedia	42.86%	3
Journal of Online Learning and Teaching (Merlot)	0.00%	0
Directory of Open Access Journals (DOAJ)	14.29%	1
OER Knowledge Cloud	0.00%	0
Other	14.29%	1
Total Respondents: 7		

Q8 The renewable assignment is defined as "an artifact that has personal meaning to students and is shared publicly under the open license of creative commons CC-BY." Please rate your satisfaction regarding the concept of renewable assignments in EDIT 730:

Answered: 6   Skipped: 2
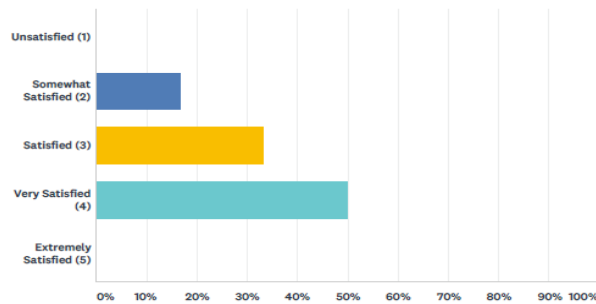
ANSWER CHOICES	RESPONSES	
Unsatisfied (1)	0.00%	0
Somewhat Satisfied (2)	16.67%	1
Satisfied (3)	33.33%	2
Very Satisfied (4)	50.00%	3
Extremely Satisfied (5)	0.00%	0
TOTAL		6

Q9 If your response to the previous question was 1, please explain:

Answered: 1   Skipped: 7

Q10 What are the most important factors that influenced you regarding the renewable assignments? Please, check all that apply

Answered: 7   Skipped: 1
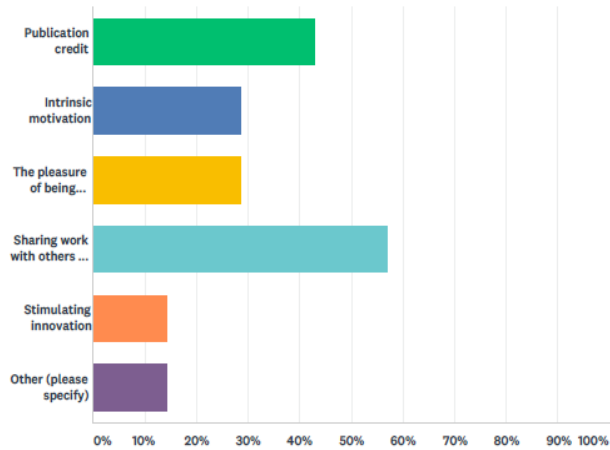
ANSWER CHOICES	RESPONSES	
Publication credit	42.86%	3
Intrinsic motivation	28.57%	2
The pleasure of being involved in peer production	28.57%	2
Sharing work with others for educational purposes	57.14%	4
Stimulating innovation	14.29%	1
Other (please specify)	14.29%	1
Total Respondents: 7		

Q11 Now that you understand the concept behind renewable assignments, are you willing to share your future assignments of other courses with others under an open license?

Answered: 7   Skipped: 1
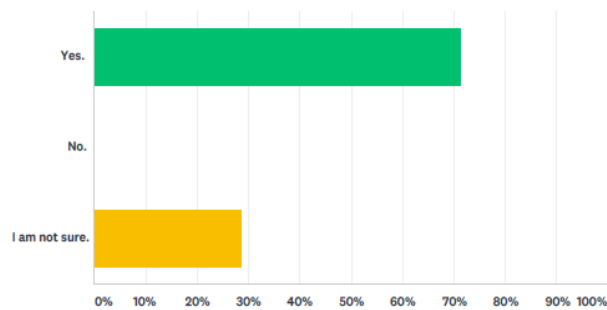
ANSWER CHOICES	RESPONSES	
Yes.	71.43%	5
No.	0.00%	0
I am not sure.	28.57%	2
TOTAL		7

Q12 What do you like best about the renewable assignments approach in EDIT 730?

Answered: 5   Skipped: 3

Q13 What do you think are the main barriers that hinder you from publishing your assignments under the creative commons license?

Answered: 4   Skipped: 4

Q14 If you would like to participate in future studies in the area of open educational resources, please write your email

Answered: 4   Skipped: 4

Appendix D

Instructor Perceptions of Renewable Assignments in OER Adoption

Q1. How do you perceive the concept of renewable assignments in the adoption of OER?

Q2. How do you perceive the value of implementing renewable assignments in your class?

    a)   What works well? What is your concern regarding applying renewable assignments in your class? Why or why not? If so, how it can be solved

Q3. How do you perceive the quality of OER were used in your course?

Q4. With reference to "renewable assignments", what do you think the most important information or understandings that graduate students need to know about?

Q5. In your opinion, do you think your current pedagogy practices used for this course must change with adopting the concept of student-generated OER in a form of renewable assignments?

Q6. What do you think, the types of pedagogy practices can support students-generated renewable assignments?

Q7. Can you describe the drivers might encourage your students to turn their assignment to OER/renewable assignments?

Q8. Overall, how do you describe the students' motivation to go with the concept of renewable assignments? What concerns do they have?

Q9. Do you have any comments regarding improving the intervention for the next class. What suggestions do you have for future improvement in the implementation?

The detailed Document of The Components of Developing the OER Intervention

Stage 1: Identify Desired Results	
Learning Outcome: • **Appreciate the value and usefulness of OER in the teaching and learning process**	
● **Enduring Understanding***:* 　o Understanding of OER and copyright information 　o Understanding the university ownership copyright 　o Identifying OER repositories 　o Understanding the process of 5R	● **Skills (***Students will be able to):* 　o Using, producing, publishing, and sharing OER 　o Editing (remixing, critiquing, and revising) OER content 　o Differentiating between CC licenses 　o Building on existing knowledge
Stage 2: Plan Learning Experiences	
Assignment A	**Constructivist Learning Environment (CLE) Criteria and Applications**
Description/ Instructions	In groups, students will:

	a. Identify the theoretical principles and instructional characteristics of CLEs based on the readings and additional reliable resources.
	b. Contrast these to the theoretical principles and instructional characteristics of objectivist or behaviorist learning environments.
	c. Take a look at an existing CC example of CLEs in MERLOT (Advanced Instructional Design) and critique the extent to which the selected CC CLE example embodies the principles of constructivism using the CLE assignment criteria. You have to create an account in MERLOT to use "add a comment".
	d. Find and share an example of a CLE that is technology supported and subscribes to the CLE principles and characteristics identified, and critique the extent to which the selected CLE example embodies the principles of constructivism. Did the CLE example fully embody the principles identified? Why or why not? Can it be improved upon? Was it effective as a CLE/TSLE?
	The end product for this assignment is a 15–20 min in-class presentation that describes the findings of the group with respect to these items. More detail is provided on the course website under "Assignments."

Operationalizing 5R/ Sharing OER Renewable Assignment	The 5Rs are operationalized through the following activities:
	  3. Critique the CC CLE examples for previous students in MERLOT using the "add a comment" feature.
	  4. Develop a closed repository at the research university's library to house all CLE examples (open or not), in which the critique can happen.
	
	Sharing and publishing the CLE assignment under CC license is optional: Students can choose one of two things:
	Option A: Publish and share assignments under CC license in MERLOT or OER Commons that can be disseminated outside the boundaries of the university
	Option B: Retain their assignments in a repository affiliated to GMU that can be used within the course.
	
	Students who select Option A need to understand the different types of CC licenses, select and add an appropriate CC license to the work, and upload it to MERLOT or OER Commons.

Technology	● Searching database ● Wikis ● MERLOT

Resources	- To create an InfoGuide by the library team in topics related to constructivism and connectivism and build it in the LMS Bb of the course - MERLOT resources - Open access journals
Assignment B	Research Brief
Description/ Instructions	Each student will select a constructivist-based pedagogical model (e.g., cognitive apprenticeship, community of practice, situated learning, problem-based learning) OR an instructional strategy (e.g., collaboration, articulation, scaffolding, problem solving), OR a learning technology (e.g., immersive tools, collaboration tools, knowledge representation tools) and write a research brief based on the 5 Things You Need to Know About: 1. What is it? 2. How does it work? 3. Who is doing it? 4. How effective is it? 5. What are its implications for instructional design? Students can use the CLE examples selected for the first assignment or the learning design problem shared in the discussion forum to create a scenario for this research brief assignment. References should include course readings as well as new empirical research including open access articles related

	to the selected model, strategy, or technology. The research brief papers represent studies to be published in MERLOT or open journals.

Operationalizing 5R/ Sharing OER Renewable Assignment	This assignment is executed using
	   ● Threading across assignments
	      ○ CLE presentation
	      ○ Research Brief
	      ○ Learning Design problem
	
	The 5Rs are operationalized using the CLE presentation executed for the first assignment (open or not) to create a scenario for the research brief assignment.
	Sharing and publishing the research brief assignment under a CC license is optional. Students can choose one of the following:
	   ● Option A: publish the research brief in MERLOT or an open journal
	   ● Option 2: Publish the research brief by creating a Wikipedia entry
	   ● Option 3: Retain the assignments in a repository affiliated to GMU that can be used within the course

Technology	● Wikipedia or similar ● Generate an editable encyclopedia entry

Resources	- InfoGuide in topics of this course related to constructivism and connectivism - Previous research briefs in MERLOT as examples - Dissertations openly available literature review - Instructor's video.
Assignment C	Designing a Technology Supported Constructivist Learning Environment (TSCLE)
Description/ Instructions	Individually or in small groups, students will select a constructivist based pedagogical model or the meaningful learning characteristics and will apply a grounded design approach (i.e. the Meaningful Online Learning Design Framework)to develop a prototype of the TSCLE for a specific target audience and learning content. The prototype will demonstrate how supportive, dialogic, and exploratory instructional strategies are implemented. Students can use the components of the research brief such as to use the principles and characteristics of the selected topic for the research brief to develop the design table to design the TSCLE. The final deliverable for this assignment should include the following three components: 1. A proposal (design document) describing the parameters of the TSCLE including the learning problem, target audience, learning outcomes (knowledge/skills/content), pedagogical model or meaningful learning framework, instructional

	strategies, learning activities, learning technologies, and assessment approach.
	2. A design table depicting the grounded design of the TSCLE. The table is a blueprint or storyboard of the prototype and should illustrate the mapping or alignment of the following design elements: (1) learning outcomes, (2) instructional strategies, (3) learning activities or tasks (what the learners will do) and how these activities support meaningful learning, (4) the learning technologies that will enable learners to accomplish these tasks, and (5) assessment criteria.
	3. A prototype of the TSCLE showing the learning activities that the learners will engage in and the supporting learning technologies. The prototype can be developed in PPT or a technology of your choice (e.g., wiki, google sites, Wix, WordPress, Adobe Captivate, etc.).
Operationalizing 5R / Sharing OER Renewable assignment	The 5Rs are operationalized by the following activity: • Students can consider using the learning design problem shared in the discussion forum or the real assignment of the research brief to design a proposal and design table for TSCLE. Sharing and publishing the TSCLE assignment under a CC license is optional. Students can choose one of the following: • Option A: The components of this assignment can be published in MERLOT, OER Commons, an open journal, or any other open repository.

	• Option B: Retain the assignments in a repository affiliated to the university that can be used within the course.

Stage 3: Determine Acceptable Evidence

Assignment A: Rubrics for Evaluating CLE Presentation (25%)

Instructor Evaluation Criteria (20 points): these are the actual criteria in the rubric. It was valued for 20 points including 5 points for peer evaluation, but with integrating OER, we pull (5 points) to assess students on reviewing CLE example presentations in MERLOT

Presentation (6)
• Adequacy and quality of presentation materials in supporting the presentation (were the presentation materials effective in articulating the group's understanding of the requirements, e.g., use of visuals, animations, organization, etc.)
• Organization of presentation (includes staying within timeframe, covering what you plan to cover, clarity, effectiveness, design of presentation)
• Evidence of teamwork (presentation should indicate that partners have collaborated on every aspect of its preparation and delivery)

• Content (14)
• (4) CLE principles and characteristics are clearly identified, grounded in the readings, epistemology table, and additional reliable resources (citation of references in APA expected)
• (4) Contrasting CLE and OLE principles and instructional characteristics is based on their theoretical grounding and instructional implications and clearly articulated using examples or research evidence
• (4) CLE example clearly aligns with the principles and instructional characteristics of constructivism or related theory (e.g., connectivism, distributed cognition) as identified above; the CLE demonstrates an applied example of constructivism; the design of the CLE is explained

• (4) How well did the selected example embody the principles of constructivism? Were the learning technologies used to implement the CLE appropriate? Critique the design and the use of technology in facilitating the implementation of the CLE.
Reviewing CLE Example presentations in MERLOT (5 points) • Create an account in the MERLOT OER database • Access the CLE page in MERLOT • Select one example of the CLE presentation • Provide comments in the comments section by using "add a comment" • Your comments should be based on the CLE principles and criteria identified in the CLE example presentation
Assignment B: Rubrics for Evaluating Research Brief (25%) There is no addition to the criteria in the rubric of this assignment except the text in red color

- (3 points) What is it? (Define it, describe it, its theoretical grounding, underpinnings, history, epistemological orientation) (*250 words*)
- (4 points) How does it work? (What are its instructional characteristics, what is the role of the instructor, role of the student, instructional strategies, learning activities, in other words how is it designed or what are its design elements and features, how should instruction be structured to facilitate learning using this model, strategy, or technology) (*250 words*)
- (4 points) Who is doing it? (Provide evidence or examples of practice or applications of this model in a variety of settings, in other words, how is it being applied/practiced and where) (*250 words*)
- (4 points) How effective is it? (Use credible resources including open access articles to explore what does the research say about its effectiveness in terms of improving learning, problem solving skills, critical thinking skills, etc.) (*250 words*)
- (5 points) What are its implications for instructional design? (When would an instructional designer recommend the use of this model, strategy, or learning technology in an organization or a teaching and learning context? What types of learning outcomes or skills are best supported by this model, strategy, or learning technology? What learning/training problems does it help solve? Provide a real world authentic scenario or case problem that addresses this model, strategy, or learning technology) (*500 words*)
- (5 points) Bibliography in APA style, writing cohesiveness/effectiveness, formatting using 2-columns, appropriate headings, professional look and feel.

The research brief should be modeled after EDUCAUSE Learning Institute (ELI) 7 THINGS YOU SHOULD KNOW ABOUT publications

http://www.educause.edu/research-and-publications/7-things-you-should-know-about

The research brief should be written as a scholarly research paper with a bibliography at the end.

Assignment C: Final Project Evaluation Criteria
Designing A Technology Supported Constructivist Learning Environment (25%)
No change or modification in the criteria for the assignment C

Appendix F

Core Design Principles Alignment with Research Questions of Focus Group

Core Design Principles Before Refinements	Focus Group Research Questions
Identify Desired Results	
• A student-created OER intervention should be based on a learner-centered approach using constructivist strategies of learning that manifest in open teaching and learning practices.	1. What should students know, understand, and be able to do to become co-producers of OER content? a. What prerequisite knowledge and skills do students need to know, understand, and be able to do before engaging in OER creation? b. What key knowledge and skills do students need to have in order to practice the 5Rs for creating and sharing OER content? c. What would students have to know about CC licenses in order to create and share OER content online with few restrictions?
Plan Learning Experiences	
• OER-enabled pedagogy promotes students' active participation in knowledge construction by shifting to a learner-centered approach,	1. What should faculty do pedagogically to engage students in OER creation and how might they change their current pedagogical approach?

prompting learners to collaborate, contribute, and connect to learning communities beyond the course by engaging in the 5R practices.	a. What are some activities/tasks that the instructor can change in current pedagogy to engage students in OER creation? b. How can the 5R practices be operationalized and integrated into the activities and tasks in EDIT 730 to support students' creation of OER or building upon existing OER renewable assignments?
● For OEP to occur, OER should be part of the pedagogy of the course; educators need to use pedagogical models grounded in constructivism and connectivism to enhance innovation in teaching and learning and support the learner-generated OER content approach.	1. How should the assignments in EDIT 730 be restructured to direct students toward practicing the 5Rs to create OER renewable assignments? 2. How should the learning activities (online discussion, blog posts, wiki) in EDIT 730 be restructured in a way that supports students' engagement in OER creation and encourages future students to practice the 5R? What are the open digital repositories that may be used to support the reuse, repurposing (using the 5R activities: retain, reuse, revise, remix, redistribute), and delivery of OER renewable assignments? 3. What resources (books, media, websites, people, etc.) would be available to support faculty in engaging students in OER renewable assignment creation and sharing online under CC licenses? 4. How would students license work in EDIT 730? Do students need to have the opportunity to define the intention of their licenses and the permissions they grant others to use their works? OR does the instructor determine definite licenses for all students' works?
● A student-created OER intervention should develop greater opportunities for both students	1. What are the open digital repositories that may be used to support the reuse, repurposing (using the 5R activities: retain,

and faculty to become competent in using digital repositories for searching, repurposing (using the 5R activities, retain, reuse, revise, remix, redistribute), and sharing OER materials in public with no or few restrictions or keeping them in private repositories.

- A student-created OER intervention should boost engagement with OER by considering accessibility, ease of use, and flexibility for repurposing and sharing, and by providing OER content that is relevant to subject areas, competitive with traditional textbooks, and peer reviewed.

reuse, revise, remix, redistribute), and delivery of OER renewable assignments?

2. What are the core activities that students and faculty should use to search for and evaluate OER materials to accomplish the tasks (assignments and learning activities in EDIT 730)?

Determine Acceptable Evidence

1. How will students demonstrate their understanding of Creative Commons licensing and 5R practices through executing the learning activities and assignments of EDIT 730 that will result in student-generated OER renewable assignments?
2. By what criteria will students' OER renewable assignments be judged?
3. How will the instructor and students in EDIT 730 ensure the quality of OER content before releasing it to others in public?

Appendix G

Focus Group Discussion Guide

Stage 1: Identify desired results

1. What should students, know, understand, and be able to do to become co-producers of OER content?

    a. What key knowledge and skills do students need to know in order to practice the 5R for creating and sharing OER content?

    b. What would students have to know about CC licenses in order to create and share OER content online with few restrictions?

Tasks (individual): using work activity notes (Yellow & pink sticky notes) as follows:

First (5 m): Each participants will write the skills should students able to do on the pink sticky notes and the knowledge should students know and understand on the yellow sticky notes.

Second (5 m): I will ask participants to *prioritize* the knowledge and skills based on three categories (*enduring understanding*, *important to know and do, worth being familiar with*) to put on the certain area on the wall. Put the *enduring understanding* as the bullseye of the course design, then *important to know and do*, then *worth being familiar with.*

Resources: Syllabus, poster of OER definition and the 5R practices, collective of associated definitions.

Stage 3—Plan Learning Experiences and Instruction

Part 1: Positioning the current pedagogy practices (open discussion) instructor's perspectives

We started by asking the instructor of the course about the:

1. What are the current pedagogy practices you using in teaching the course.

2. What faculty should do pedagogically to engage students in OER creation and how might they change their current pedagogical approach?

    a. What are some activities/tasks the instructor can change and innovate in current pedagogy to engage students in OER creation?

    b. How can the 5R practices be operationalized and integrated in the activities and tasks in EDIT 730 to support students' creation of own OER or building upon existing OER renewable assignments?

Part2: Restructuring assignments and learning activities

1. How should the assignments in EDIT 730 restructured to direct students toward practicing the 5R to end in creating OER renewable assignments? What are the open digital repositories that may be used to support the reuse, repurposing (using the 5R activities, retain, reuse, revise, remix, redistribute), and delivery of OER renewable assignments?

2. How should the learning activities (online discussion, blog posts, Wiki) in EDIT 730 restructured in a way that supports students' engagement in OER creation and promote future students to practice the 5R? What are the open digital repositories that may be used to support the reuse, repurposing (using the 5R activities, retain, reuse, revise, remix, redistribute), and delivery of OER renewable assignments?

1. What are the resources (books, media, web sites, people, etc.) would be available to support faculty in engaging students in OER renewable assignments creation and sharing online under CC licenses?

Task (Orange & Green) (15 m): In groups, participants will discuss thoughts and ideas about restructuring the instructions of the assignments and learning activities in the EDIT 730 and to innovate new approaches for executing it. I will provide them the visual map (an alignment grip) for learning outcomes, assignments, 5R integration, technology medium, and the required resources might be available to support faculty in engaging students in OER creation and experience the 5Rs practices. After 15 minutes of discussion, each group will present their ideas and post sticky notes on the wall under

*plan learning experiences (*assignments). **Participants should keep into consideration the following things:**

1. The existing OER renewable assignments for previous students where future students can practice the 5R.
2. To think about technology tools and resources.

Resources: The Course Mapping of the Learning Experiences for assignments and learning activities in EDIT 730, example of research brief template.

Part 1: Open discussion

2. How would students license work in EDIT 730? Do students need to have the opportunity to define the intention of their licenses and the permissions they grant others to use their works? OR the instructor determines a definite licenses for all students' works?

Part 2: Open Discussion

3. What are the core activities students and faculty use to search for and evaluate OER materials to accomplish the tasks (assignments and learning activities in EDIT 730?
4. What are the tools/ software students may use to support the development of OER renewable assignments?
5. How the quality assurance of OER renewable assignments would be evaluated before it's released online

Stage 2: Determine Acceptable Evidence

In two groups: Discuss & review:

1. How will students demonstrate their understanding of creative commons license and 5R practices through learning activities and assignments of the EDIT 730 (online discussion, blog posts, and assignments) that will result in student-generated OER renewable assignments?
   a. What can the instructor change in the current assessment to measure the desired result of OER integration?
2. By what criteria will students' OER renewable assignments be judged?
3. How do the instructor and students in EDIT 730 ensure quality of OER content prior it's release to others in public?

Task (Blue): in two groups,

 First: discuss the assessment method that would be embodied in the current assessment methods for assignments and learning activities in the EDIT 730, write it down in the orange notes, read loud, and then put it in the wall under "*evidence*". The participants will be given the visual map of assignments and assessment methods for discussion and modifications.

Second: discuss about the criteria will be used to assess students understand of the 5R practices of OER, and how do the instructor and students in EDIT 730 will ensure the quality of OER content prior it's release to others in public. The participants will be given the drafts of criteria for evaluating the quality of OER renewable assignments for discussion.

Resources: poster, Visual map of EDIT 730, Criteria for evaluating OER renewable assignments

<center>**Appendix H**</center>

<center>**One-on one Interview Questions**</center>

Stage 1: Identify desired results

2. You asked me regarding the knowledge and skills if they are within the process or at the end of the process, what is the difference, could you explain me more? **(SD)**

3. For learning outcomes, you pointed that learning objectives from engaging in OER creation is to know to how to do this and appreciate it from the different levels of Bloom Taxonomy; so making students learn about OER and CC, in which level do you think we can formulate our learning outcomes **(SD).**

4. You posted under knowledge to use knowledge of reputable publishers to access/ integrate OER materials, can you give me examples of these publishers? **(AD)**

Stage 3—Plan Learning Experiences and Instruction

Change in current pedagogy

3. The integration of OER in a college course that will result in OEP requires instructors to use learner-centered pedagogical models, what faculty should do pedagogically to engage students in OER creation? **(SN)**

4. What are some activities/tasks the instructor can change and innovate in current pedagogy to engage students in OER creation? **(SN)**

Part2: Restructuring assignments and learning activities

6. Dr. Dabbagh struggling little bit with the first assignment because that will make the assignment bigger because I asking them now only to go back and look at previous CLE examples, but also go out and do their own and do what with it. So, we're trying

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to thing how we're going to make these fit, what do you think? How the instructor can make this fit with the overall assignments and activities of the course? **(SN)**

7. The instructor struggles with that "if research brief worth 25 points and this person Autum got 25 out of 25 on this research brief, how students can revise it because it's perfect"? What do you think? **(SN)**

8. Do you think the learning activities (online discussion, blog posts) in EDIT 730 can be restructured in a way that supports students' engagement in OER creation and promote future students to practice the 5R? **(SN)**

9. You proposed under assignment A to "Build a database of CLE examples from previous courses (open or not) and align a critique to each example", do you mean the closed repositories? **(AM)**

10. What do you mean by restructuring the Assignment B (research brief) Threading across assignments/ building 5R using these assignments

    o CLE presentations

    o Research Briefs

    o Designing CLEs

    How students will use first assignment to build the second assignment? **(AM, ND)**

11. What do you mean under assignment B "Reusing, revising within the class, Reusing/revising outside the class"? **(AM) & ND**

12. You mentioned in restructuring the assignments based on OER integration and 5Rs practices that "It just want to have these assignments and keep pushing them back to the resources to build the resources from each other". Can you explain it in more details **(AM)**

13. Can you explain me more your idea and understanding of " when we talking about remixing and reusing things, this is really what it typically mean like taking pieces of original, creative content, more creative than factual, the less pressure to need CC license on it to do kind of work that scholar do"? **(AM)**

14. Now, you're proposing that students will revise, remix previous students assignments that are under CC license, do you think it will be benefit for future students to provide them the feedback given to previous classes on their assignments? (ND)

15. You proposed one of the resources would be used to perform the research brief assignment are *Dissertations openly available list review*, can you explain me more the idea, and it's purpose of using it in performing this assignment? **(AM & ND)**

16. What accuracy means to you?

17. You mentioned how to evaluate these resources that providing open access articles lend to evaluate these resources accuracy, what are the core activities students and faculty use to search for and evaluate these OER materials they found? **(AD)**

18. What accuracy means to you?

19. You proposed for the final project that it is a Capstone and there is no change in instructions, make this an open resource example in a journal or database, what is your idea, can you explain me more? **(ND & AM)**

20. That's would be difficult to build repositories in MERLOT with these licenses, that's right, but are we allow to take that and put it in the library database like the one we're talking about or…I mean can we just take these students assignments from previous semester and put it in the repository in closed repository, is what we are doing conflict the university policy? **(AM)**

21. What do you mean by saying "Research brief is integrated, already remixed and reused for the real assignment" **(ND)**

22. Can we talk more about the current pedagogy you are currently using in teaching this course? **(ND)**

23. After the discussion in the focus group meeting, what do you the change might occur in your current pedagogy? **(ND)**

24. What do you think about the idea of distributing the points of assignment A as to put 20 points on the original and pull 5 points off that and use it for the critique, OR it may be 30 for assignment A, 20 for assignment B, and 25 for assignment C? **(ND)**

Stage 2: Determine Acceptable Evidence

25. What do you think about the criteria developed to measure the desired result of engaging students in OER creation and the 5R practices? **(SN)**

26. In order to assess students understanding to OER and its associated components, what do you think if we added the following criteria that students would recommend the next step for somebody else could do with this assignment or I will say to suggest the area of improvement for the future students? **(AM, ND)**

Appendix I

Designer Reflection

Integrating OER into this college course was very difficult. However, in redesigning the course, we used the strength of having OER renewable assignments for previous classes to use as a base for students to practice the 5Rs. The Advanced Instructional Design course was designed based on a semi-constructivist approach, so there was no major change in the pedagogy. Integrating OER and operationalizing the 5Rs in the syllabus involved restructuring the main assignments but not the in-class and online learning activities (in-class and online participation). The practitioners from the research university came up with the idea of building the next assignments on the previous one; they called it "threading across assignments." All participants agreed that the students would learn about OER and experience the 5R, but sharing and publishing their own work under CC licenses could not be compulsory. Students have the freedom to publish or not publish their work.

The changes to each assignment are described as follows. For the first assignment, two learning activities were added to the current instructions: students will explore resources under OER intervention in Bb, and they will select an example of a CLE in MERLOT and critique the extent to which their selected example embodies the principles of constructivism using the CLE assignment criteria. Examples of students' CLE Presentations in MERLOT will be provided under the assignment section. The evaluation criteria were adjusted accordingly. The instructor's evaluation had been graded for 20 points, and peer evaluation had been graded for 5 points. The change that was made was to replace peer evaluation with commentary activities in MERLOT that would be graded for 5 points. The end project was not changed, but the dedicated time for the CLE presentation was decreased from 20-25 to 15-20 minutes, which is not related to OER. To

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encourage students to make their assignments OER, the instructions for publishing (including images and videos of publishing in MERLOT or OER Commons) were located under Module 2/week 4, when students make their CLE presentations. Students who want to publish are advised to follow the instructions under the OER intervention section in the course site.

For the second assignment, a minor change was suggested. The idea of building assignments from one to another was initiated, to use 5R activities. In this assignment, the suggestion was that students go back to the first assignment and look at the selected CLE example for their presentation to create the scenario for the research brief assignment. In this assignment, students are encouraged to use open-access journals parallel to existing databases. Thus, the librarian built an InfoGuide page within the course site in the LMS Bb. No change was made in the evaluation criteria other than encouraging students to use open-access articles. Under Module 4/week 11, students are encouraged to publish research brief papers in MERLOT, OER Commons, or open journals and generate a Wikipedia entry by following the instructions under the OER intervention. Thus, they can explore how they can add materials to a different digital repository and how they can create an entry in Wikipedia.

For the third assignment, the idea of threading assignments was continued. Students can use the learning design problem or components of the research brief, such as the principles and characteristics of the selected topic, to develop the proposal and design table for the TSCLE prototype. No change was made to the evaluation criteria for this assignment. Under week 16, students are encouraged to consider uploading the components of the final project (the proposal, the design table, and the prototype) to an OER repository such as MERLOT or OER Commons.

Based on the common challenge of low-quality OER content in education worldwide, I customized criteria for evaluating the quality of OER renewable assignments before releasing them online. These criteria include accuracy, production quality, accessibility, flexibility, and licensing. Regarding resources, a section of the OER intervention was created in the menu bar of the course Bb. This section covers the

required information and knowledge students should know and understand at the end of the course. This section includes an overview of the intervention, including contact information for the researcher, for any questions the students have regarding OER. In addition, it includes narrated introductory presentations that introduce the concept of OER and renewable assignments, a variety of resources about OER, copyright, and Creative Commons licenses. Furthermore, it covers the resources related to searching for and using MERLOT and OER Commons, and it also shows how to create an entry Wikipedia. This OER intervention could be embedded in any college course in different disciplines.

Appendix J

The Institutional Review Board Exemption Letter -January 28, 2019

DATE: January 28, 2019

TO: Nada Dabbagh, Professor
FROM: George Mason University IRB

Project Title: [1372860-1] GENERATING DESIGN PRINCIPLES THAT SUPPORT
                               INTEGRATING OPEN EDUCATIONAL RESOURCES IN A COLLEGE
                               COURSE: A DESIGN-BASED RESEARCH STUDY

SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: January 28, 2019
REVIEW TYPE: Expedited Review

REVIEW TYPE: Expedited review category #7

Thank you for your submission of New Project materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form unless the IRB has waived the requirement for a signature on the consent form or has waived the requirement for a consent process. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the IRB office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

This study does not have an expiration date but you will receive an annual reminder regarding future requirements.

Please note that all research records must be retained for a minimum of five years, or as described in your submission, after the completion of the project.

Please note that department or other approvals may be required to conduct your research in addition to IRB approval.

If you have any questions, please contact Katie Brooks at (703) 993-4121 or kbrook14@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

GMU IRB Standard Operating Procedures can be found here: https://rdia.gmu.edu/topics-of-interest/human-or-animal-subjects/human-subjects/human-subjects-sops/

Pre-Course Survey For Students: Local Impact Evaluation

Basic Demographics
The following are general questions related to you and your courses at GMU.
Q1. Select your gender
❍ Male
❍ Female
❍ Other

Q2. What is the length of your work experience?
❍ Less than 1 year
❍ 1–2 years
❍ 3–4 years
❍ 5–6 years
❍ 7–8 years
❍ 9–10 years
❍ More than 10 years

Q3. Write your current job
title_____

Q4. Are you currently a full-time or part-time student in your program?
❍ Full-time
❍ Part-time

The Term Open Educational Resources
Q5. To what extent are you knowledgeable about OER?
"Open Educational Resources are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others. OER include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools,

materials, or techniques used to support access to knowledge" (William and Flora Hewlett Foundation, 2002).

- ❍ Very knowledgeable
- ❍ Knowledgeable
- ❍ Somewhat knowledgeable
- ❍ Not knowledgeable

Q6. When was the first time you heard about OER?
- ❍ From Dr. Dabbagh during EDIT 730 course
- ❍ Resources under student-created OER intervention in the EDIT 730 course
- ❍ Internet
- ❍ Friends
- ❍ Another institutions
- ❍ Conference
- ❍ Other:

_____

Q7. What do you think are the most important values of OER? Please check all that apply.
- ❍ Cutting down the costs of subscriptions and publications
- ❍ Promoting flexibility and customizability (user can modify, innovate, or reuse OER in specific contexts for any purpose)
- ❍ Promoting shareability
- ❍ Contributing to continuous improvement of OER materials because of 5R practices
- ❍ Promoting personalized learning (user selects what he/she wants to learn and how to learn)
- ❍ Equalizing access to information for all
- ❍ Enhancing learning performance
- ❍ Promoting reputational benefits for OER contributors
- ❍ I am not sure

Q8. Are you familiar with the 5R (retain, reuse, revise, remix, and redistribute) practices of using OER?
- ❍ Yes
- ❍ No
- ❍ Somewhat

Q9. If your response to the previous question was Yes or Somewhat, please give an example of using the 5R practices with OER materials available online. If not, then skip to the next question

_____

_____

Q10. Please add any additional information you would like to learn about OER and the 5R practices.

_____

_____

_____

Copyright and Open Licensing
Q11. Copyright is a legal term describing creators/authors' rights to their intellectual property. Do you know how the law defines George Mason University's ownership of the copyright to your work/assignments?
❍ Yes
❍ No

Q12. The following are different types of open licenses with different degrees of openness. Please check the types of open licenses you are familiar with:
❍ Public domain
❍ Fair use
❍ Creative Commons license
❍ Not familiar

Q13. A Creative Commons license is an open license that offers a standardized way to label authors' work with some rights reserved under conditions of their choice. Do you know the differences between copyrighted content and Creative Commons (CC) licensed content?
❍ Yes
❍ No
❍ Not sure

Q14. Do you understand the spirit and intention behind open licensing?
❍ Yes
❍ No
❍ Not sure

Q15. Please add any additional information you would like to learn about the university ownership copyright law and CC licenses.

_____

_____
_____

OER Repositories

Q16. Which database(s) do you always use for your own searches? Please check all that apply.

○ Google
○ Wikipedia
○ Journal of Online Learning and Teaching (Merlot)
○ Directory of Open Access Journals (DOAJ)
○ OER Knowledge Cloud
○ OER Commons
○ OpenStax
○ None of the above

Other_____
___

Q17. Please add any additional information you would like to learn about locating and searching for OER materials.

_____
_____

Q18. If you decide to publish your assignments under a Creative Commons license, what additional information would you like to learn about?

_____
_____

Appendix L

Focus Group Questions for Students: Local Impact Evaluation

Perceptions of OER Renewable Assignments

Q1. What is your perception of the concept of OER renewable assignments (student's contribution to OER creation) implemented in this course? (10 m)

- o Who like it? What do you like best about the renewable assignments approach in EDIT 730?

- o Who don't like it? What don't you like about it?

Q2. How do you think students benefit from making their assignments OER under a CC license? (10 m)

- o Do you think you will adopt and use this kind of user-generated OER in your field of practice? How might you use it in your profession?

- o What are the factors/drivers that motivate you to turn your assignments into OER or deter you from doing so?

Advantages of the Main Assignments in Enhancing Students' Learning

Q3. Would you describe the main assignments of this EDIT 730 course as enhancing your learning about designing a constructivist learning environment? Do you have any suggestions about how this assignment could be changed to produce meaningful content that can be published online as a public good? (10 m)

Perceptions of the 5R practices

Q4. What do you think about your engagement in critiquing the CC CLE example presentations in MERLOT? (1) Did it contribute to enhancing your understanding of the

principles of constructivism? (2) Did your participation in MERLOT help you in executing your CLE presentation assignment? (10m)

Q5. What do you think how future students can practice the 5R in reusing previous students work in this course? (10m)

Q6. Do you have any suggestions about alternative ways to integrate a student-created OER approach in this course? (10 m)

Perceptions of the Concept of Threading Across Assignments

Q7**.** How would you describe the importance of allowing students to use the components of previous assignments to build upon the next assignment? For example, the instructions for the research brief directed you to use the learning design problem example or to use the CLE example to create the potential scenario for the research brief and or to review examples of previous research briefs in MERLOT in which you can cite these examples or build on them. Similarly, for the final project you were instructed to use the learning problem design or components of the research brief to create the proposal and the design table for the TSCLE. (10m)

- o Did you employ this concept of threading across assignments in building the scenario of the research brief assignments? (5)

Q8. Do you have any additional comments?

Appendix M

Post-Survey Questionnaire for Students: Local Impact Evaluation

A. The Benefits and Drawbacks of Student-Created OER Intervention in Increasing Students' Awareness of OER

Q1. The information included under the student-created OER intervention section in the EDIT 730 course Blackboard (as shown below) was helpful for me to build knowledge and understanding of OER and associated concepts such as Creative Commons (CC) licenses, the 5R permissions, and different OER repositories.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Student-created OER Intervention section in Bb

Q2. If your answer to the previous question (Q1) was "neutral," "disagree," or "strongly disagree," can you explain why the information was not helpful for your learning?

……………………………………………………………………………………………………
..

Q3. Do you have any suggestions of additional information/resources that should be provided for future students?

……………………………………………………………………………………………………
..

……………………………………………………………………………………………………
…..

Q4. I learned about the different types of Creative Commons (CC) licenses and selecting the appropriate license for my work.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
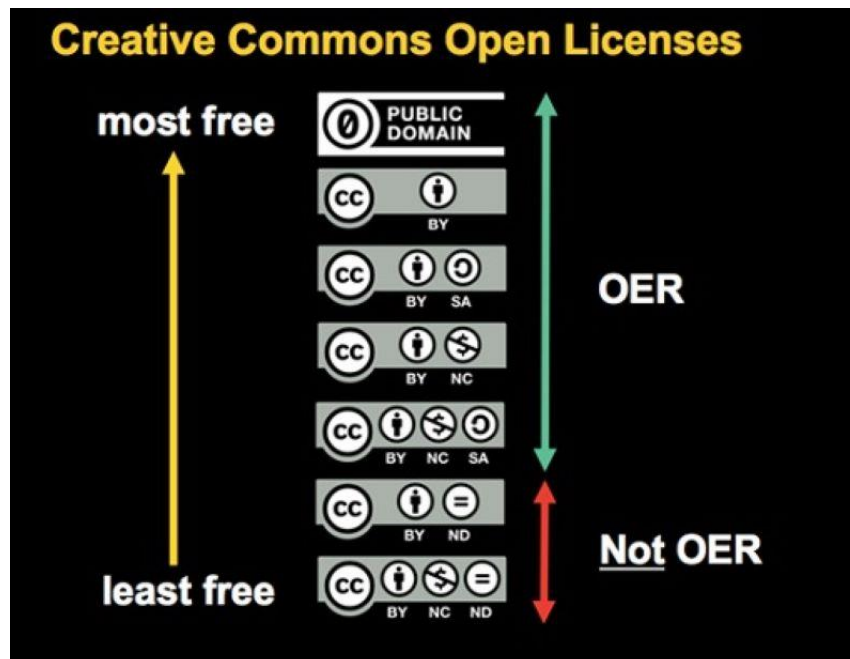
Q5. I learned about the different OER databases in my related discipline (Examples of OER databases are shown below).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Open Access Web Repositories

- **Creative Commons**
  Creative Commons helps you legally share your knowledge and creativity to build a more equitable, accessible, and innovative world.
- **Digital Public Library of America**
  DPLA connects people to the riches held within America's libraries, archives, museums, and other cultural heritage institutions. All of the materials found through DPLA—photographs, books, maps, news footage, oral histories, personal letters, museum objects, artwork, government documents, and so much more—are free and immediately available in digital format.
- **HathiTrust**
  HathiTrust is a partnership of academic & research institutions, offering a collection of millions of titles digitized from libraries around the world.
- **Merlot**
  The MERLOT system provides access to curated online learning and support materials and content creation tools, led by an international community of educators, learners and researchers.
- **OER Knowledge Cloud**
  Established to identify, collect, preserve and disseminate available documents of enduring value to researchers, industry, government, scholars, writers, historians, journalists and informal learners.
- **Openstax**
  OpenStax is a nonprofit educational initiative based whose mission is to give every student the tools they need to be successful in the classroom. They publish high-quality, peer-reviewed, openly licensed college textbooks that are absolutely free online and low cost in print.
- **Scholarly Publishing and Academic Resources Coalition (SPARC)**
  SPARC (the Scholarly Publishing and Academic Resources Coalition) works to enable the open sharing of research outputs and educational materials in order to democratize access to knowledge, accelerate discovery, and increase the return on our investment in research and education.

Q6. If your response to the previous question was "strongly agree" or "agree," please specify the database you used.

…………………………………...
.

Q7. If your response to the previous question (**Q5**) was "strongly disagree" or "disagree," please specify why you didn't learn about it or you didn't use it?

…………………………………...
.

B. **The Usefulness of Student-Created OER Intervention in Opening Teaching and Learning Practices in EDIT 730**

Q8. Have you used any of the OER materials assigned as additional reading resources under module 1(week 1, entitled: Exploring Educational Theory) and module 3 (week 6, entitled: Cognition and Instruction/Problem Solving, Critical Thinking and Argumentation)?

- Yes
- No
- I am not sure

A renewable assignment is defined as "an artifact that has personal meaning to students and is shared publicly under the open license of Creative Commons CC-BY." In this course, you had the option to upload your assignments in MERLOT and/ or in OER Commons. Please answer the following questions

Q9. I decided to share my assignments executed in this course online under a CC license.

- Yes
- No

Q10. If your response to the previous question was yes,

  a. Please specify what type of CC license did you select for your work?

  - Public Domain
  - CC-BY
  - CC-BY-SA
  - CC-BY-NC
  - CC-BY-NC-SA

  b. Please specify where you shared your work (e.g., MERLOT, OER Commons)

  ……………………………………………………………………………….

  C. Please, specify the assignments you shared in MERLOT or/and in OER Commons?...
  .

Q11. If your response to Q9 was "no", what do you think are the main barriers that hinder you from publishing your assignments under the Creative Commons license?

Q12. Do you feel there is a continuum of knowledge across the main assignments (CLE presentation, research brief, final project (TSCLE)) and learning activities (posting reflection in discussion forums and WordPress) of this course?

- Strongly agree

- Agree
- Neutral
- Disagree
- Strongly disagree

Comments you want to add………………………………………………….

Q13. Did you use any components of previous assignment in this class or any components of assignments in previous classes within the IDT program to execute the final project (TSCLE) for this course (EDIT730)?

- Yes
- No

Q14. If your response was "Yes", please explain…………………………..

The Usability of the Student-Created OER Intervention

Q15. Did you find the instructions for the constructivist learning environment (CLE) assignment that directed you to select and critique a CLE presentation example in MERLOT (as shown below) easy to navigate and follow?

- Yes
- No
- Somewhat

Learning Activities

Complete Week 2 readings

Explore online resources under Week 2

Continue refining epistemology comparison table based on new readings and instructor and peer feedback

Review existing CLE example presentations in the MERLOT database and provide comments per assignment details (see below on how to access MERLOT)

Begin researching an example of a technology supported CLE with your teammate, share such examples in the wiki space for discussion

Post a blog on week 2 readings **by midnight 09/09**, guidelines will be provided in Bb (blog #2) in the blog area

How to Use MERLOT

Creating an account in MERLOT

Add a comment in MERLOT

Examples of Students' CLE Presentations in MERLOT

A webpage in MERLOT encompasses the OER renewable assignments for previous students who made their CLE presentations under CC license for others to use. Take a look at an existing CC example of CLEs in MERLOT (Constructivist Learning Environments (CLEs)) and critique the extent to which the selected CC CLE example embodies the principles of constructivism using the CLE assignment criteria. To complete this task, you have to create an account in MERLOT, access the webpage and select the CLE example. To critique the selected example, use "add a comment" as demonstrated in the following image.

MERLOT Browse ▾ Add ▾ Communities ▾ Partner Benefits ▾ News & Info ▾ About MERLOT ▾   Log In Sign Up

Search keywords, title, URL, ISBN, or author   Go   Advanced Search Options ▾
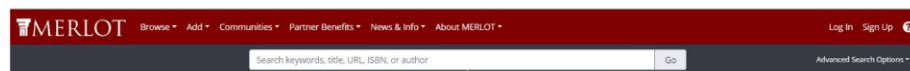
Q16. If your response to the previous question was "yes", explain what you found easy?

Q17. If your response to the previous question was "no" or "somewhat," in your opinion what areas could be improved?

Q18. Did you face any difficulties in using the feature "add a comment" in MERLOT to critique the selected CC CLE presentations of previous students?

- Yes
- No
- Somewhat
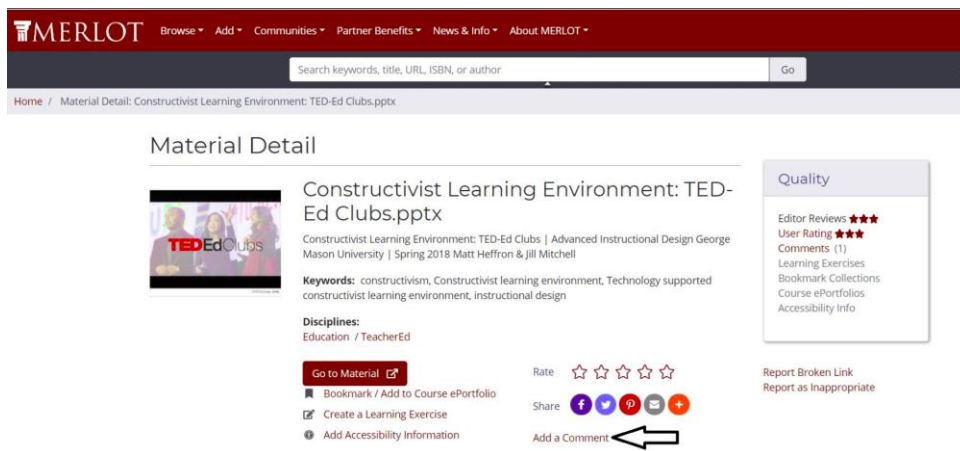
Q18. Did you find the instructions about finding research brief examples in MERLOT and WordPress (as shown below) easy to navigate and use?

- Yes
- No
- Somewhat

Q20. Did you find the InfoGuide page on the Bb course (as shown below) helpful in searching for empirical studies for your research brief assignment and other learning activities?

- Yes
- No
- Somewhat

Q21. Did you find the instructions, Maimoona Al Abri, sent it via email found below, for turning your assignments into OER content under a CC license easy to follow?

- Yes
- No
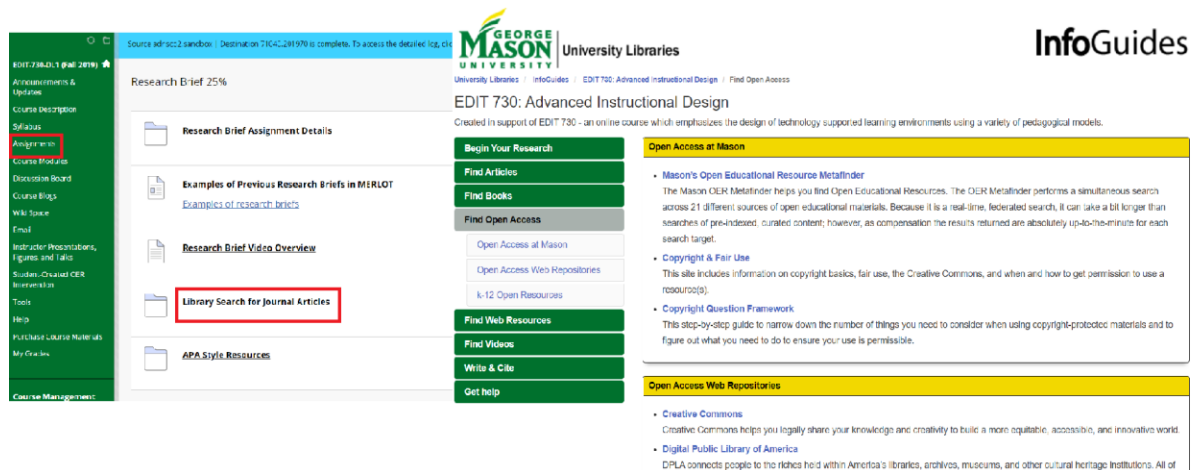- Somewhat

Hello class in EDIT 730,

First of all, thank you for your participation in the online survey.

Under learning activities in Module 2 (week 4), an option for you if you wish to make your assignment (CLE presentation) OER and upload it to MERLOT or OER Commons.

If you decided to make your assignment OER under CC license, the instructions are as follows:

- Access Blackboard and download your CLE presentation.
- Select the type of CC license in which you want others/ future students in this class to use your work. To learn more about different types of CC license, explore resources under student-created OER intervention (An Overview of Copyright and Creative Commons Licenses)
- To create CC license for your CLE presentation, you can access (https://creativecommons.org/choose/), follow the instruction to select the type of CC license for your work. Your selected CC license will be created automatically in the website. Copy the license and past it in the first or last slide of your presentation. The second option to create your CC license is to add CC add-in to the Microsoft office so, you can create your CC in the PowerPoint presentation itself.
- After you created the CC license for your CLE presentation, access MERLOT OR OER Commons) to upload your CLE presentation.
    - To upload your assignment in MERLOT, you need to upload it in OneDrive or any other places where users can access to view and reuse it. Log in to MERLOT, select (add a material to MERLOT), and follow the instructions to submit it in MERLOT database. Also, you can explore resources under student-created OER intervention (how to use MERLOT "how to add materials to MERLOT").
    - To upload it in OER Commons, join the Advanced Instructional Design group in OER Commons and upload your assignment in this group. When you uploaded, it will appear pending for approval from the OER Commons administrator. It will take couples of days to be published (no further actions are required).
- After you completed publishing your assignments in any CC database, please, send me the URL of your CLE presentation to add them to the webpage of all CC assignments.

Publishing your CLE presentation in CC database makes it a scholarly publication that you can add it to your CV. You will get cited if others download, use, and reuse it. More information how to attribute CC licensed work is under the intervention section (Referencing Creative Commons Work). Here is an example of attributing CC assignments for previous students in their CVs:

Heffron, M., & Mitchell, J. (2018). Constructivist learning environment: TED-Ed clubs [PowerPoint slides]. Retrieved from https://www.merlot.org/merlot/viewMaterial.htm?id=1374804. Creative Commons Attribution 4.0 International License

If you have any questions, clarification or you need further information, please let me know.

Q22. Do you have any suggestions for additional instructions that should be provided for future students?

……………………………………………………………………………………..

Appendix N

Interview Questions for the Instructor: Local Impact Evaluation

Aims of the interview	Interview Research Questions
1. Examine the effectiveness of the OER intervention based on the instructor perceptions 2. Explore pedagogical models that can advance the use and creation of OER based on the instructor's perspectives.	Q1. Did you perceive a change occurred in the pedagogy practices of your course due to integrating OER and the 5R practices in the instructions of the main assignments? Q2. In the process of redesigning the course, the idea of *threading across assignments* has been initiated and integrated into the instructions of the main assignments, Can this idea change the way individuals learn and allowing them to learn in new ways? Do you think this idea to be a useful strategy for course design? • Based on students' feedback about the concept of building an assignment from another assignment, they mentioned that they missed this part in the instructions embedded in the main assignments, how would you remedy this missing piece in future classes? • Students' feedback about the continuum of knowledge across the main assignments was that the assignments could have been sequenced better, do you think you can change the instructions of some of these assignments to empower students to build their work across assignments?

	Q3. Based on students' feedback about the concept of threading across assignments is to apply it across classes for the entire IDT program, how would you explain to what extent this recommendation can be accomplished? • What's your thought about students' use of projects they had done in other courses (e.g., EDIT 704 & 705) to build the final project for this course (EDIT 730)? Q4. Students' feedback showed that sharing and reusing OER content would be more practical with teaching resources, but not for students' course assignments. To what extent do you agree or disagree? Q5. How would you describe your vision of building a database (a digital repository) of previous and current students' assignments (open or not) to empower the integration of the 5R in the main assignments of your class in the future? Q6. Are you going to continue the use of the OER intervention in your pedagogy of this course in future courses? Q7. In your opinion, what are the main considerations faculty must think about to change in pedagogy practices in courses to improve the use of OER beyond accessibility and to focus more on encouraging students' contributions to OER creation and practicing the 5Rs?

Appendix O

Development of Design Principles that Support Integrating OER in a College Course

Design Assumptions		Exploratory & practice experiences	Sources
Influencing Factors for engagement with OER	**Quality Assurance**	Quality of OER (Competitors and robust, peer-reviewed materials, inclusiveness of OER resources, and relevant to different subject areas) Another motivating factor is students' willingness to go back and spend the time to polish their assignments to make them publishable.	Allen & Seaman (2016) Maimoona (2017) Maimoona (2018) California Open Educational Resources Council (2016) Murphy(2013)
	Flexibility	Accessibility, own full control of content, build academic freedom, , Creativity, practice the 5Rs activities Ease of use and easy access to OER via familiar platform influence faculty to fill in the gaps of OER movement. There is a relationship between individual's perceptions of OER and its ease of use, and usefulness in general.	Jung, Bauer, & Heaps (2017) Kelly (2014) Maimoona (2017) Zhang & Li (2017)

		Well-designed OER content can contribute to improving the attitudes of OER adoption There is a relationship between individuals' self-efficacy and willingness of knowledge sharing. Most faculty endorsed the attributes of OER that pertains to relative advantages and compatibility The OER creators need to consider the audience and usability of these resources.	
	Personal Value	Students tended to endorse sharing works with others and publication credits more than factors such as intrinsic motivation, the pleasure of being involved in peer production, and stimulating innovation. The benefits of OER are promoting shareability, equalizing access to information for all, personalized learning. Students are most like about renewable assignments are personal credit, removing financial barriers to knowledge.	Maimoona (2018)

| | | The primary value of renewable assignments for students was letting students feel they owned their assignments and could do something with them, such as putting them up for public consumption. These virtues of renewable assignments encourage students to become more proactive and value their assignments beyond the course limits.

Other value of renewable assignments might become citable; people will cite them when they use them, and the students can add them to their CVs.

Students' awareness of the concept behind renewable assignments motivated them to be more engaged in making their assignments open and publishing them publicly. | |
| | **Participatory Learning Culture** | Students valued the idea of sharing assignments with future students, and found it helpful to see other student work samples for the same projects the participants were working on.

Students are most like about renewable assignments are the availability of OER online, helping others in immediate work or community learning, sharing | Maimoona (2018) |

		knowledge, and finding it helpful to look at work samples of students going through the same program or course. Students can receive good feedback from the public over time, not only from the instructor and peers, for improvement purposes.	
	Supporting Team	Supporting team (cooperative work among critical roles such as instructional designers, instructional technologists, and librarians at an institutional level is necessary, maintaining OER content)	Kelly (2014) Maimoona (2018)

	Pedagogy change in the OER use	Including feedback given to previous classes on their assignments for current students before they use them as best practice models, not showing students the best practices from previous classes, and instructions can be included in the assignments to have them go out and look for examples by themselves, to integrate the instructions for the assignments as a part of the class, adding official processes of peer review among students (e.g., commenting on assignments through WordPress),and creating a rubric to assess the quality of these assignments could help to ensure their quality before posting them publicly. OER initiatives needed to center on different aspects, such as innovating educational practices to raise the quality of OER, and that the utilization of OER required a "culture of sharing, valuing innovative and social-network-based forms of learning, and encouraging novel pedagogical models. The concept behind open pedagogy is not the usage of OER materials per se; rather, engaging in the 5R activities is the main point.	DeRosa & Robinson (2017) Ehlers (2011) Maimoona (2018) Wiley (2017)
Promoting OEP in Learning Contexts			

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		When the OER content became the central focus of a course and was designed to thoroughly promote engagement in learning, the course could shift to a learner-centered approach. The potential of open pedagogy (OER-enabled pedagogy) for promoting students' active participation in knowledge construction instead of knowledge consuming.	

| | **Constructivist engagement in learning process** | The use of open textbooks can improve pedagogy practices when faculty use such as active learning strategies, collaborative learning, and authentic learning; students to have a strong sense of ownership of their learning.

Teachers learn how to support user-generated content rather than expert content, and direct students to acquire self-assessment processes.

Students need to be independent/autonomous learners, self-assessed., and work collaboratively with peers to learn from each other and provide constructive feedback on their learning.

OEP to occur, educators need to engage OER in integration with new pedagogical models such as constructivism and connectivism to advance active and self-directed learning.

Primary attention must be given to open educational practices that immerse students in active and productive engagement with content/knowledge, tools, and services that are required for | Ehlers (2011)
Geser (2012)
Hegarty (2015)
Hogan et al. (2015)
Jung, Bauer, & Heaps (2017) |

		supporting the learning process and promoting needed skills such as self-management, creativity and group work. OER could reinforce a user-centered approach in learning and accordingly, in lifelong education; learners in the world of OER became the producers of educational content and were motivated to share their works with others. Open pedagogy based on the attribute of openness, which enables instructors and learners to collaborate, share work, and interact through distributed learning environments readily	

Appendix P

Criteria for Evaluating the Quality of OER Renewable Assignments

These criteria were adapted from OER content from the following sources:
- http://researchguides.austincc.edu/oer/criteria
- http://collegeopentextbooks.ning.com/page/review-2
- BCOER (Faculty Guide for Evaluating Open Education Resources)

ACCURACY
☐ Is the information in the resources accurate?
☐ Are there any factual, grammatical, or typographical errors?
☐ Is the content well-categorized in terms of logic, sequencing, and flow?
☐ Is the content consistent with its language and key terms?

PRODUCTION QUALITY
☐ Is the content in the resource clear and understandable?
☐ Are the interface and design easy to navigate?
☐ For audio or video resources, is the sound quality high?

ACCESSIBILITY
☐ Is the resource available in alternative formats (e.g., DOC, PPT)?
☐ For audio or video resources, is there a transcript or subtitles?
☐ If you are using web resources, does each image have alternate text that can be read?
☐ Are students able to access the materials in a quick, non-restrictive manner?
☐ For graphics, does the author include tags or long descriptions?

FLEXIBILITY & LICENSING
☐ Is the content designed in a file format which allows for adaptations, modifications, remixing, and updates?
☐ Is the content licensed in a way which allows for adaptations and modifications?
☐ Is the content licensed in a way that allows for educational reuse?

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Biography

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