

How Does an Environmental Educator Address Student Engagement in a Meaningful
Watershed Educational Experience (MWEE)?

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Abstract

HOW DOES AN ENVIRONMENTAL EDUCATOR ADDRESS STUDENT ENGAGEMENT IN A MEANINGFUL WATERSHED EDUCATIONAL EXPERIENCE (MWEE)?

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Children represent the future and thus by providing them with effective environmental educational experiences, educators may be taking a critical step in preventing “the probable serious environmental problems in the future” (Gökhan, 2010, p. 56). The Meaningful Watershed Educational Experience (MWEE) is an excellent example of one such education program. MWEEs aim to educate and enhance the students’ relationship with the Chesapeake Bay Watershed through an integration of classroom activities and fieldwork. As environmental educators and role models, field interpreters are a major component and significant influence on the local MWEE programs, however their perspective as to how they have impacted the programs has yet to be examined. Through a qualitative analysis and specific focus on the behavioral, emotional, and cognitive dimensions of student engagement, the researcher intended to address this void. The

focus of the study was to examine how the local MWEE field interpreters understood and addressed student engagement in a field setting. This was measured via data collected from observations of and semi-structured, one-on-one interviews with each field interpreter involved with the local MWEE programs. Data analysis uncovered that field interpreters demonstrated a strong awareness of student engagement. Furthermore, they defined, recognized, and addressed student engagement within the constructs of the emotional, behavioral, and cognitive dimensions. Ultimately, the individual experiences of each MWEE field interpreter provides insight into the phenomenon, however further research is required to strengthen the awareness of how, if at all, their perspectives of student engagement directly impact student outcomes.

Introduction

Environmental psychologists have termed the “adverse physical, social, and psychological effects of childhood nature deprivation” (Larson *et al.*, 2011, p. 73) as a nature-deficit disorder. To combat the detrimental effects of children’s disappearing experiences with nature and the environmental problems and issues we face as a world, environmental education movements and initiatives have taken shape across the globe.

The Meaningful Watershed Educational Experience (MWEE) is an excellent example of one such education initiative. Fourteen years ago, the *Chesapeake 2000 Agreement* was developed to reaffirm the commitment set forth by the people of Virginia, Maryland, Pennsylvania, Washington D.C., the Environmental Protection Agency (EPA), and the Chesapeake Bay Commission to restore and protect the Chesapeake Bay. Of the five goals set forth to remove the Chesapeake Bay from the EPA’s impaired water list by 2010, the aforementioned groups developed a goal to strengthen and improve stewardship and community engagement. This goal promises to “promote individual stewardship and assist individuals, community-based organizations, businesses, local governments and schools to undertake initiatives to achieve the goals and commitments of this agreement.” (Chesapeake Bay Program, 2000, p.11) Within

this document the following two objectives led to the establishment and requirement of the MWEE:

1. Beginning with the class of 2005, provide a meaningful Bay or stream outdoor experience for every school student in the watershed before graduation from high school.
2. Provide students and teachers alike with opportunities to directly participate in local restoration and protection projects, and to support stewardship efforts in schools and on school property. (Chesapeake Bay Program, 2000, p.11)

MWEEs aim to educate and enhance the students' relationship with the Chesapeake Bay Watershed, through an integration of classroom activities and fieldwork. In past research, data have been obtained to assess how teachers and students impact the effectiveness of the MWEE program (Johnson, 2011; Kraemer, Zint, & Kirwan, 2007), however the story of the field interpreter has yet to be told.

The field interpreter has a critical role during the action phase of the MWEE. At this stage of the lesson, they guide students on a field investigation and teach them important watershed and life science concepts based on their school system's curriculum. Given that the field interpreter is a major component of the local MWEEs in particular, it is important to obtain their perspective as to how they believe they contribute to the program through specific examination of how they interpret and address student engagement. For the purposes of this study, the MWEE field interpreters involved with the field investigations for both the Fairfax County Public Schools (FCPS) and Prince William County Public Schools (PWCS) MWEE models are the main focus of research.

Environmental Education

Vaughan, Gack, Solorazano, and Ray (2003) define environmental education as “a continuous learning process where individuals become aware of their environment and acquire knowledge, values, skills, and experiences to solve environmental problems for present and future generations” (p. 12). The international recognition of the field of environmental education stems from the development of the Belgrade Charter and the Tbilisi Declaration by the United Nations Education Scientific and Cultural Organization (UNESCO) and the United Nations Environment Program (UNEP). Together, these two documents state the widely accepted goals of environmental education, which are fostered by environmental education programs worldwide (NAAEE, 2010).

Science education experiences may be conducted in the classroom, laboratory, or outdoors, however Orion and Hofstein (1994) found that the outside environment is the least utilized space by teachers. Many researchers have found that in addition to complementing classroom-based formal education, outdoor educational experiences positively impact student outcomes (Ballantyne, Fien, & Packer, 2000; Emmons, 1997; Janiuk, 2013; Kusmawan, O’Toole, Reynolds, & Bourke, 2009; Orion & Hofstein, 1994; Sivek, 2002; Sobel, 2012). These outcomes include environmental knowledge, beliefs, attitudes, literacy, and stewardship.

There is an inherent need for informal education opportunities to provide a well-rounded environmental education experience that expands classroom instruction into the real world. Scientific concepts taught in a classroom setting may sometimes be abstract

or potentially difficult for students to conceptualize. When integrated with a hands-on outdoor educational experience, such as a MWEE field investigation, these complex topics may be easier to comprehend. Research has proven that hands-on environmental education strengthens the academic performance of students (Chesapeake Academic Resources for Teachers, n.d.). Additionally, according to a study conducted by Kusmawan *et al.* (2009), students who participated in active science learning experiences, displayed positive improvements in their environmental knowledge, beliefs, attitudes, intentions, confidence to act, and critical thinking skills, in comparison to students who learned solely in a formal classroom setting. However, it must be noted that outdoor environmental education experiences are less effective when used in place of formal education and instead should be used in conjunction with classroom instruction as support (Janiuk, 2013). Sobel (2012) went on to highlight that current environmentalists ascribe their environmental values and behaviors as an adult, to their participation in outdoor experiences as a child. When educational programs integrate outdoor environmental education opportunities with classroom-based instruction, as the local MWEE programs do, the academic, behavioral, and emotional outcomes of students are enhanced and can carry through into adulthood.

Children represent the future and by providing them with effective environmental education experiences, educators may be taking a critical step in preventing future environmental problems (Gökhan, 2010). Furthermore, through the intergenerational transfer of knowledge, children have the ability to act as catalysts to impact environmental change in the present day (Ballantyne, Fien, & Packer, 2000).

These researchers found that hands-on experiences, which focused on local environmental problems, were not only enjoyable for students, but also aroused their interest and awareness in environmental issues. In turn, these students were more likely to discuss their experiences with their family or community members.

Environmental educators, such as the MWEE field interpreters, play a critical role in the development of environmental knowledge and awareness for these students. It is their responsibility to provide the students with an education that will prepare them to be scientifically literate and environmentally responsible citizens and stewards. An important antecedent to environmental literacy is environmental sensitivity, or “an empathetic or understanding view of the environment” (Sivek, 2002). He found that the environmental sensitivity one has as an adult, is achieved as a teenager, approximately the same age range as the local MWEE students. Additionally, his research concluded that most students perceived an environmental educator who was knowledgeable, open-minded, active or involved, and friendly or accessible as the most important factor that impacted their environmental sensitivity. Similarly, Emmons (1997) found that students view environmental educators as role models who influence their cognitive knowledge and emotional awareness of environmental issues. In order to maximize cognitive learning in students, the environmental educator must be perceived as a credible source. Finn, Schrod, Witt, Elledge, Jernberg, and Larson (2009) found teacher credibility to be the most important factor, from the student perspective, to impact student learning and the teacher-student relationship. They described credible instructors as those who were competent, trustworthy, and caring, which in turn led to the students feeling understood

and an increase in communication with, and a respect for, the instructor. Stern, Powell, and Hill (2013) cited environmental educators who were comfortable, eloquent, knowledgeable, passionate, sincere, and charismatic, as the most influential on positive visitor outcomes. In addition to their outdoor experiences as children, many environmentalists also attribute environmental role models as major contributors to their environmental values and behaviors as an adult (Sobel, 2012).

In the document, *Guidelines For the Preparation and Professional Development of Environmental Educators*, The North American Association for Environmental Education (NAAEE) describes six attributes that are crucial to the development of a well-prepared and influential environmental educator. These include environmental literacy, foundations of environmental education, professional responsibilities of the environmental educator, planning and implementing environmental education, fostering learning, and assessment and evaluation (NAAEE, 2010). Environmental literacy refers to the educators understanding and awareness of the concept as well as their mastery of the curriculum and required skills. The theme foundations of environmental education, refers to the need for educators to understand the evolution, goals, and implementation of environmental education. Professional responsibilities of the environmental educator include the responsibility to act as a professional role model, emphasize education, and continue to pursue opportunities for professional development. The fourth theme, planning and implementing environmental education, includes the provision of “interdisciplinary, hands-on, investigative learning opportunities” (NAAEE, 2010), the ability to adjust lessons so that they are appropriate for the cognitive level of their

audience, the utilization of a safe and appropriate environmental setting, and the awareness and implementation of a variety of environmental education materials and techniques. Fostering learning refers to the educator's ability to behaviorally, emotionally, and cognitively engage the audience, as well as collaborate with other environmental educators. Finally, assessment and evaluation includes the educator's ability to review and adjust their environmental education program to achieve the highest degree of effectiveness. Each of these attributes will be touched upon throughout the remainder of this paper.

Meaningful Watershed Educational Experience (MWEE)

MWEEs are an example of environmental education experiences, specific to the Chesapeake Bay Watershed, which are integrated into and connect the standards-based classroom activities of formal education with informal hands-on field investigation experiences. Through MWEEs, students learn how to assess the health of their local ecosystem and begin to foster pro-environmental attitudes and behaviors, such as environmental ethics and stewardship, which are critical to the protection and sustainability of the Chesapeake Bay Watershed ("Meaningful Watershed Educational Experience", n.d.).

Through the joint efforts of the Potomac Environmental Research and Education Center (PEREC), NOAA's Bay Watershed Education and Training Program (B-WET), George Mason University (GMU), FCPS and PWCS two local MWEE programs were developed for the students of FCPS and PWCS. Through GMU's partnership with FCPS and PWCS, two different MWEE models and curriculums were jointly developed for

each school system (FCPS, 2013; Calhoun *et al.*, n.d.). According to the Chesapeake Bay Program Education Workgroup (2001), in order to be defined as a meaningful Bay or stream experience, the following eight components must be included:

1. Experiences are investigative or project-oriented.
2. Experiences are richly structured and based on high-quality instructional design.
3. Experiences are an integral part of the instructional program.
4. Experiences are part of a sustained activity.
5. Experiences consider the watershed as a system.
6. Experiences involve external sharing and communication.
7. Experiences are enhanced by natural resources personnel.
8. Experiences are for all students. (p.1)

A MWEE meets each of these components and is thus considered to be a meaningful Bay or stream experience (“What is a MWEE?”, n.d.). First, MWEEs include activities where students can develop and answer scientific inquiries and investigate environmental problems or issues through data collection and analysis. They provide opportunities for students to utilize electronic technology, such as computers, probeware, and GPS equipment. Additionally, students participate in project-oriented experiences that address the problems or issues directly related to the people and communities of the Chesapeake Bay.

Second, each of the local MWEE programs are composed of the same three phases: preparation, action, and reflection. The preparation phase primarily takes place in a classroom setting, where the teacher provides students with the opportunity to conduct background research on a particular problem or issue and guides them in discussion and field safety preparation. Topics the students may choose to investigate include, what a watershed is or the importance of water conservation. In this phase,

students can participate in activities such as building a model ecosystem or using Geographic Information Systems (GIS) maps and the NatGeo Fieldscope ArcGIS Explorer program to look at the layers of the park or stream that they will be visiting during their field investigation. For the purposes of this study, the researcher will only be focusing on the action phase, which is the outdoor experience of the MWEE. During this stage, students undergo a field investigation of their local watershed, where they can be actively involved with data collection and observations. For the local MWEE programs, graduate and undergraduate students from George Mason University (GMU) and retired PWCS teachers were hired as field interpreters. It is their responsibility to teach the students about the watershed through a variety of stations designed to cover important curriculum goals, such as how to assess the health of the watershed and the impact the local watershed has on the surrounding community. These stations include, but are not limited to, topics such as Land Use, Biodiversity, Water Quality, and Biology. Finally, in these MWEE models, the reflection phase takes place partially on site at the park or stream and partially in the classroom. Following every station, students are provided with an opportunity to ask the field interpreters questions and discuss what they have learned. This conversation then continues in the classroom, where students discuss their experience, analyze and evaluate their conclusions, and address additional inquiries with their fellow classmates and teachers. Additionally, for the local MWEE programs, students are asked to develop an environmental stewardship plan or project which would address the problems or issues they observed during their experience.

The three phase design of the local MWEE programs provides an opportunity for pre-visit introduction, the preparation phase, as well as a post-visit review of the experience, the reflection phase. In a study of a residential environmental education program, conducted by Stern, Powell, and Ardoin (2008), it was found that both pre-visit preparation and post-visit review have the potential to greatly enhance the long-term impacts of an outdoor educational experience. Alone, the pre-visit or post-visit experiences did not affect student outcome, however when utilized together, a significant impact was observed. Thus, it can be anticipated that thorough completion of all three phases of a MWEE can lead to positive student outcomes.

Field investigations for the local MWEE programs are taught concurrently with the classroom curriculum and correlate with the state's learning standards, thus the third component is met. In FCPS, the MWEE is a component of the *Testing the Waters* lesson, which is one of the 11 lessons from the seventh grade science curriculum, *Understanding Our Environment* (FCPS, 2013). As found in the teacher notes for the *Testing the Waters* lesson (FCPS, n.d.), students are expected to meet the following learning standards after completion of the lesson:

1. The student will construct and interpret data tables.
2. The student will select appropriate tools to accurately measure using, and making conversions, among metric units.
3. The student will formulate valid conclusions after analyzing data and observations.
4. The student will develop and reinforce an understanding of the nature of science.
5. The student will use chemicals and equipment safely.
6. The student will investigate and understand the effects of natural and human interactions on the health of a watershed.

7. The student will monitor and analyze water quality using field equipment and hand-held technology.
8. The student will investigate and understand the effects of human actions on habitats.

In PWCS, the MWEE is a component of the sixth grade science curriculum. According to the curriculum found in the document, *From the Mountains to the Estuary: From the Schoolyard to the Bay: Meaningful Watershed Experiences for Grade 6 Students* (Calhoun, Greene, Sklarew, Jones, Smith, & Johnson, n.d.), after the completion of the MWEE program PWCS students are expected to achieve the following learning standards:

1. The student will plan and conduct investigations that are increasingly sophisticated and involve a refinement of science process skills.
2. The student will investigate and understand that all matter is made up of atoms.
3. The student will investigate and understand the role of water in the natural and human-made environment.
4. The student will investigate and understand the natural processes and human interactions that affect watershed systems.
5. The student will investigate and understand public policy decisions relating to the environment.

For both the FCPS and PWCS models, the MWEE is much more than an outdoor environmental education experience, it is an integral component of each school district's curriculum and was designed to assist in meeting the mandated learning standards. Unfortunately, given that MWEE field investigations are only taught for a short period of time in both the Fall and Spring seasons, the MWEE lesson may take place in a different order than what is outlined in the school districts' curriculums. This was frequently recognized and described by the participating field interpreters in this study as an influential factor impacting student engagement.

Fourth, MWEEs are considered to be part of a sustained activity, where a significant amount of instructional time from the school year is devoted to the experience. This includes pre-visit preparation, the outdoor experience itself, and post-visit reflection. Not all outdoor experiences of the MWEEs are strictly water-based, however there is an intentional connection between each field investigation activity and the water quality, watershed, or ecological system as a whole. Therefore, as explained by the fifth component, MWEEs consider the watershed as a system.

During and following the completion of the reflection phase, one of the anticipated end products of each MWEE is for students to share their results with their school and local community. Therefore, MWEEs meet the sixth component of a meaningful Bay or stream experience. Seventh, the local MWEE programs hire college students and retired teachers to work as field interpreters, where they not only teach the students during the action phase, but they also serve as role models and pass on their knowledge and experience to the students. Just as the MWEE program complements each school district's curriculum, the environmental and technical knowledge of these field interpreters complements the classroom teacher's lessons and abilities. Lastly, regardless of the specific demographics of the students, MWEEs are for all students and no child is excluded. This may include students with disabilities, in alternative programs, and special populations.

FCPS MWEE Model

Prior to their arrival, it is anticipated that teachers have taught the first three lessons of the science curriculum and have introduced GIS tools as a technique for

assessing the health of the Chesapeake Bay Watershed. For the FCPS program, a typical MWEE field investigation includes six stations. Four of these stations, Land Use, Water Quality and Habitat, Biodiversity, and Biology; are taught by GMU field interpreters. Each of these four stations are doubled to allow for more students to receive the best possible experience. This means there are two Biology stations, two Biodiversity stations, two Land Use stations, and two Water Quality and Habitat stations. The two remaining stations are developed and taught by FCPS teachers. The lessons taught at these two stations may fluctuate. Overall, FCPS MWEE students rotate through six total stations during a typical day, including each of the four stations taught by GMU field interpreters and the two stations taught by their teachers, where each rotation lasts approximately 20 to 25 minutes.

At the Land Use station, students examine the terrestrial environment's buffer zones, amount of shade, condition of stream banks, hardness of the soil, and degree of development. Field interpreters utilize long measuring tapes, metric rulers, dowel rods, topography maps, and aerial photographs of the local area to teach the students how land use impacts the aquatic ecosystem. At the Water Quality and Habitat station, students first assess the condition of the habitat, including the sediment, streambed habitat, trash, and pollution. Then they utilize water chemistry tests, such as temperature, dissolved oxygen, pH, conductivity, and nitrites, to examine the quality of the aquatic ecosystem. Through the utilization of LabQuest technology and additional water chemistry testing equipment, such as sensors and probes, field interpreters assist the students in assessing the health of the stream. At the Biodiversity station, students count the number of

different animal, fungi, and plant species they observe, categorize them as native or invasive, and analyze the data for the amount of biodiversity present at their location. Field interpreters utilize two hula hoops, one placed in an area of high biodiversity and the other placed in an area of low biodiversity, as well as species identification sheets to assist the students with identifying variations in biodiversity and environmental disturbances. Finally, at the Biology station, students collect and identify benthic macroinvertebrates to assess the health of the aquatic ecosystem. At this station, field interpreters utilize dip nets, strainers, invertebrate identification sheets, and bug viewers to help the students to collect and identify benthic macroinvertebrates, which are good indicator species for the health of the stream. Collaboratively, all four stations provide students with the opportunity to assess the health of the ecosystem using the same data collection techniques implemented by professional scientists.

During orientation, FCPS MWEE field interpreters are provided with teaching manuals that provide a detailed description and objective of each lesson, the materials and directions for setting up each station, as well as suggested questions and dialogue for interactions with students. Many of the field interpreters who participated in this study, cited using such manuals to train and prepare for the MWEE program. FCPS MWEEs may take place at Accotink Creek (part of the Accotink Creek Watershed), Lake Fairfax (part of the Difficult Run Watershed), or Burke Lake (part of the Pohick Creek Watershed).

PWCS MWEE Model

A typical field investigation for the PWCS MWEE program includes five stations, taught by retired PWCS teachers as well as field interpreters hired by GMU. These include Water Quality, Macroinvertebrates, Water Conservation, The Wetland Challenge, and Watershed Investigation. Given the variations between PWCS MWEE sites, Water Conservation and Watershed Models are only taught at the Occoquan Bay National Wildlife Refuge site and The Wetland Challenge is only taught at Manassas National Battlefield Park. Depending on the site in question, students rotate between three to four stations, where each rotation lasts anywhere between 40 to 50 minutes.

Two weeks prior to their arrival at the field investigation, PWCS teachers are expected to begin preparation and introduce watershed concepts (Greene & Sklarew, 2009). In terms of lessons and objectives, PWCS's Water Quality and Macroinvertebrate stations are identical to the Water Quality and Habitat and Biology stations from the FCPS MWEE model. The Water Conservation station is a team building activity, where the students work together to traverse an obstacle course while transporting water, thus learning how a variety of groups and individuals depend on water to survive. The Wetland Challenge involves three different team building activities, the Yurt Circle, All Tied Up, and the Migration Challenge, to illustrate to students how the cooperation of many individuals is necessary to restore a damaged or destroyed wetland. Finally, at the Watershed Investigation station, the students use topographic maps to locate their watershed and then build their own watershed with minimal erosion, runoff, and pollution, using the materials provided (Calhoun *et al.*, n.d.). PWCS MWEEs take place at either Manassas National Battlefield Park (located in the Bull Run Watershed) or at

the Occoquan Bay National Wildlife Refuge (located in the Marumsco Creek Watershed).

Student Engagement

Student engagement can be approached from multiple perspectives and there is no one true way to define it. Defining student engagement is dependent upon the purposes of engagement, intended beneficiaries, and program or institution of interest. In outdoor environmental education experiences, such as a MWEE field investigation, the definition and approach to student engagement is not only unique to each of the aforementioned factors, but also to the field site where the program takes place. For the purposes of this study, student engagement is defined as the quality of effort invested by both students and their field interpreters with the intention to improve the student field investigation experience and enhance the learning outcomes and development of students, as well as the performance and reputation of the MWEE program (Hu & Kuh, 2001; Trowler, 2010).

According to the literature, there are six generally accepted purposes of student engagement. These include engagement to improve learning, engagement to improve retention rates, engagement for equality and social justice, engagement for curricular relevance, engagement for institutional benefit, and engagement as marketing (Trowler, 2010). For this study, the aims of student engagement are to improve and inspire student learning and interest in science and the environment and to strengthen the quality of the MWEE program. Additionally, the intended beneficiaries of student engagement for this program are first and foremost the students. However, if student engagement is

successful, potential beneficiaries may include field interpreters, the schools involved, the MWEE program, the local community, and the Chesapeake Bay.

One of the many perspectives of student engagement is the holistic approach, which is utilized in this paper and views student engagement as involving “the perceptions, expectations and experience of being a student and the construction of being a student” (Kahu, 2013). Furthermore, it encompasses the three dimensions of student engagement, behavioral engagement, emotional engagement, and cognitive engagement. Each of these dimensions are frequently cited throughout the literature as important components of student engagement (Assor, Kaplan, & Roth, 2002; Burrows, 2010; Kahu, 2013; Klem & Connell, 2004; Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003; Skinner & Belmont, 1993; Trowler, 2010; Yoon, Ho, & Hedberg, 2005). Behaviorally engaged students comply with behavioral norms and refrain from disruptive or negative behaviors (Trowler, 2010). Specifically, they participate in class, demonstrate effort, persistence, and concentration, and they contribute to class discussions (Burrows, 2010). According to Trowler (2010) and Burrows (2010), students who are emotionally engaged display affective reactions, such as excitement, interest, stress, attitudes, and feel a sense of belonging or identification. Klem and Connell (2004) added that these students display positive emotions such as curiosity and optimism. Finally, all of the aforementioned researchers described cognitively engaged students as individuals who are devoted to their learning, enjoy challenging themselves, understand the importance of their work, and demonstrate positive coping skills when they do not succeed. Each of these dimensions can be placed on a continuum, where the

students may be either positively engaged or negatively engaged. The negative end of engagement is referred to in this paper as disengaged or unengaged. The value of appealing to the behavioral, emotional, and cognitive levels of students, to improve student outcomes, has been cited frequently throughout the environmental education literature (Ballantyne, Fien, & Packer, 2000; Ballantyne, Fien, & Packer, 2001; Elstgeest, 2001; Emmons, 1997; Finn *et al.*, 2009; Kusmawan *et al.*, 2009; Orion & Hofstein, 1994; Sivek, 2002; Skibins, Powell, & Stern, 2012; Sobel, 2012; Stern, Powell, & Hill, 2013).

Multiple sources agree that there is a strong correlation between student engagement and positive outcomes of student success and development (Assor, Kaplan, & Roth, 2002; Fletcher, n.d.; Kahu, 2013; Klem & Connell, 2004; Shernoff *et al.*, 2003; Skinner & Belmont, 1993; and Trowler, 2010). These outcomes include, general abilities and critical thinking, practical competence and skills transferability, cognitive development, improved self-esteem, moral and ethical development, satisfaction, improved academic performance, personal adjustment, and persistence. While each of the aforementioned student outcomes may not become immediately apparent during the course of this study, it is anticipated that through successful engagement during the MWEE field investigations they will eventually arise within each participating student. However, it must also be noted that student engagement does not happen automatically. Students must invest their time and effort to fully obtain the aforementioned benefits of student engagement. Skinner and Belmont (1993) discovered that optimal student engagement is reached when the students' needs to be competent, autonomous, and

related to others are met. The researchers explained that teachers could facilitate these needs by providing structure, communicating expectations clearly, adjusting their teaching approach for individual student needs, providing the students with freedom to explore their interests and make their own connections, and by expressing to their students that they care about them. When students perceived these teacher behaviors, they were more likely to become and remain engaged throughout the activity. Recognizing and understanding this bi-directional relationship regarding student engagement between the students and the MWEE field interpreters is critical to this study.

On the other hand, students who are not engaged or exhibit low levels of engagement may be disruptive in class, passive, bored, depressed, anxious, angry, withdrawn, rebellious, or give up easily when challenged (Klem & Connell, 2004; Skinner & Belmont, 1993). Disengagement may emerge when students do not feel challenged by or understand the meaning of the activity or do not feel cared for by the instructor (Klem & Connell, 2004). Additionally, students may be unengaged when the teacher suppresses the students' criticism or independent opinions, interferes with the students' behavioral performance, or forces students to participate in meaningless or uninteresting activities (Assor, Kaplan, & Roth, 2002). Ultimately, Klem and Connell (2004) found a strong correlation between teacher support, student engagement, and academic performance and commitment. The role and responsibility of the educator to engage their students, has profound and long-lasting impacts on student development.

As articulated previously, both action phases for the local MWEE programs take place in an outdoor environmental education setting, which provides its own unique impact and challenges with regard to student engagement. These MWEE field interpreters teach on average, 150 different students every day during each field investigation. Between FCPS and PWCS, the academic, behavioral, and emotional levels of the students, as well as the quality of the MWEE locations, does vary from day to day. As explained by Skinner and Belmont (1993), teachers may modify their behavior towards certain students based on their perception of that child's level of engagement. Not only do the MWEE field interpreters have to combat environmental distractions but they also must adjust their teaching behavior and approach based on each student engagement scenario they encounter.

In their research, Orion and Hofstein (1994) found that the two most influential factors related to student learning on a field trip were the preparation of the students for the trip and the place of the trip in the curriculum. The researchers explored the impact that environmental distractions, or novelty factors, can have on student learning and engagement in an outdoor environmental education program. Specifically, they cited cognitive novelty, geographic novelty, and psychological novelty as factors that impact student learning. Cognitive novelty refers to the concepts and skills the students utilize during the outdoor environmental education experience. Geographic novelty describes the familiarity the students have with the field investigation location. Lastly, psychological novelty refers to the students' previous experiences with field trips as social events as opposed to learning opportunities. Ultimately, Orion and Hofstein

(1994) found that adequate preparation, which provides students with the opportunity to become acquainted with each of these novelty factors, leads to a more meaningful learning experience. Furthermore, such experiences should be integrated into the school's curriculum, as opposed to being its own individual activity. Outdoor educational programs, such as the MWEE, are complex and expensive to run. Therefore, in order to validate the investment spent on such programs, they need to achieve the best educational results. The local MWEEs are already integrated into both the FCPS and PWCS curriculums, however by reducing the novelty space through teacher preparation, students are likely to achieve the most meaningful learning experience and best results. Unfortunately, for various reasons, adequate student preparation may not always be achieved. Therefore, it is also the MWEE field interpreter's responsibility to retain the engagement of each student, regardless of the novelty factors, in order to make the field investigation most effective. Potential distractions in the field include changes in the weather, students dressed inappropriately for fieldwork, park visitors, animals in the park, or even the body of water of interest.

As previously mentioned, just as students must be invested in their learning in order for student engagement to occur, teachers must also be dedicated to providing effective and engaging experiences. According to Umbach and Wawrzynski (2005), programs where the teachers design an environment that concentrates on effective educational practices, have students who are active participants in their learning and realize greater gains from their experience. Field interpreters possess an important role and responsibility with regards to providing an engaging educational experience to each

student that they teach. Skibins, Powell, and Stern (2012) developed a list of best practices for interpreters, which includes: thematic development, linking tangible and intangible concepts, engaging multiple senses, actively engaging the audience, utilizing a variety of activities and approaches to share information, communicating relevance of the subject to the audience, highlighting the relationship between the individual and location, providing opportunities for direct physical interaction with the location, development of an age appropriate lesson, and providing accurate, fact-based and/or affective information. Each of these strategies will be revisited throughout this study. Additionally, as described earlier, MWEE field interpreters act as role models for the students. Their ability to engage the students behaviorally, emotionally, and cognitively, in turn influences the students' interest in environmentalism and their academic performance. By reducing the impact of the environmental, or novelty, factors and appealing to the students behaviorally, emotionally, and cognitively throughout the MWEE, field interpreters can successfully engage and educate their students. For this study, each dimension of student engagement will be utilized in data analysis via an open coding approach of the field interpreter observations and interviews collected.

As mentioned earlier, with regard to the local MWEE program, analysis of its effectiveness has been studied from the perspective of the school's teachers and students (Johnson, 2011), however the important role of the MWEE field interpreter has yet to be examined. Thus, to strengthen the overall effectiveness of the MWEE program, this study intends to qualitatively analyze MWEE field interpreter's perspectives on the dynamics of student engagement by answering the following questions:

1. How do the MWEE field interpreters define student engagement in a field setting?
2. Do MWEE field interpreters recognize when students are and are not engaged?
3. How do MWEE field interpreters address student engagement in the field?

Procedures

Rationale for Qualitative Approach

This study is based on a phenomenological qualitative design, which examines a lived experience “for the purpose of obtaining a deeper understanding of the nature or meaning of an everyday experience” (Mayan, 2009, p. 49). In the case of this research, the phenomenon being analyzed is the field interpreters’ perspectives of how they addressed and understood student engagement during a MWEE field investigation. As previously mentioned, the situational nature of a field investigation provides its own unique impact and challenges with regard to student engagement. Through observations of and semi-structured, one-on-one interviews with each participating field interpreter, the individual experiences of each participant were analyzed to further explain the phenomenon.

Participants

Given that the intent of this study was to understand how MWEE field interpreters perceive and address the dynamics of student engagement, a convenience sampling strategy was employed therefore all field interpreters who were interested in participating in the study were included. Originally there were a total of 16 participants involved with the study, however only 12 of the participants took part in both

observations and interviews, therefore only data gathered from those 12 participants will be utilized. All 12 field interpreters taught for the FCPS MWEE program in Fall 2013, three of the 12 also taught for the PWCS MWEE program in previous seasons. Even though data were gathered solely from only two of the FCPS MWEE sites, each participant's entire experience with the MWEE program was considered during interviews. Given that some of the participants had taught with the PWCS MWEE program, the PWCS MWEE curriculum was also included in this study. While the participants were diverse in gender, they were predominantly female which reflected the composition of the entire group of MWEE field interpreters who worked in the Fall 2013 semester. Furthermore they varied regarding the MWEE sites they had worked at, MWEE stations they had taught, and years of experience with the MWEE program, as shown in Table 1.

Table 1
MWEE Field Interpreter Participant Demographics

Name	Semesters Participated	Gender	Sites Worked At	Stations Taught
Addison	3	Female	<u>FCPS</u> : Burke Lake, Lake Accotink, Lake Fairfax	Biology, Land Use, Water Quality and Habitat
April	2	Female	<u>FCPS</u> : Lake Fairfax <u>PWCS</u> : Manassas National Battlefield Park	<u>FCPS</u> : Biology <u>PWCS</u> : Wetland Challenge
Cece	2	Female	<u>FCPS</u> : Burke Lake, Lake Accotink, Lake Fairfax	Biodiversity, Biology, Land Use
Cristina	4	Female	<u>FCPS</u> : Burke Lake, Lake Fairfax <u>PWCS</u> : Manassas	<u>FCPS</u> : Biology, Land Use, Water Quality and Habitat

			National Battlefield Park, Occoquan Bay National Wildlife Refuge	<u>PWCS</u> : Macroinvertebrates, Water Quality, Water Conservation, Wetland Challenge
Jess	4	Female	<u>FCPS</u> : Burke Lake, Lake Fairfax	Biodiversity, Biology, Land Use
Joey	6	Male	<u>FCPS</u> : Burke Lake, Lake Accotink, Lake Fairfax	Biodiversity, Biology, Land Use, Water Quality and Habitat
Lorelei	1	Female	<u>FCPS</u> : Burke Lake, Lake Fairfax	Water Quality and Habitat
Meredith	1	Female	<u>FCPS</u> : Burke Lake, Lake Fairfax	Biodiversity, Biology, Land Use
Miranda	6	Female	<u>FCPS</u> : Burke Lake, Lake Accotink, Lake Fairfax <u>PWCS</u> : Manassas National Battlefield Park, Occoquan Bay National Wildlife Refuge	<u>FCPS</u> : Land Use, Water Quality and Habitat <u>PWCS</u> : Water Quality
Monica	4	Female	<u>FCPS</u> : Burke Lake, Lake Accotink, Lake Fairfax	Biodiversity, Biology, Land Use, Water Quality and Habitat
Phoebe	1	Female	<u>FCPS</u> : Burke Lake, Lake Fairfax	Biodiversity
Rachel	1	Female	<u>FCPS</u> : Lake Fairfax	Land Use

Access and Permissions

Institutional Review Board (IRB) approval was obtained from the Office of Research Integrity and Assurance at GMU before data collection began in October 2013. Given that no students were involved, obtaining FCPS or PWCS IRB approval was deemed unnecessary. All MWEE field interpreters were sent an email that detailed the

nature of the study and requested their participation. Participants were also recruited by visiting the MWEE sites during the Fall 2013 MWEE season. Each MWEE field interpreter who chose to participate signed a letter of informed consent prior to data collection. Each participant was made aware that they could choose to participate in one or all portions of the research in which they felt comfortable. Additionally, they could have chosen not to participate or withdraw at any time during the study, without any consequence. To ensure confidentiality, pseudonyms were developed for each participant and all data was stored on password-protected devices.

Data-Gathering Strategies and Study Site

Data collection began in October 2013 and extended to March 2014. The two forms of data collected were observations of and semi-structured, one-on-one interviews with each participating MWEE field interpreter. One to three observations of each participant were conducted in October 2013 during the Fall MWEE season. These observations lasted between 11 to 29 minutes. This time range was chosen due to limited time constraints and the researcher's belief that one to three observations of each participant would be sufficient to reach data saturation. Observations took place at the Burke Lake and Lake Fairfax FCPS MWEE field investigation sites. Extensive field notes were recorded during observations, including the date, location, weather, condition of the site (dry, muddy, etc.), interpreter being observed, station being taught, and start and end time of each observation. Additionally, descriptions and drawings of how the stations were set up, how the students were grouped, questions posed by the field interpreter and students, interactions between the field interpreter and students,

interactions between the students and the station tools and environment, and additional observed behavior related to the study were recorded. These field notes served to compare and contrast what actually took place during observations of the field investigations with data gathered from participant interviews as well as the field investigation lessons from the FCPS and PWCS MWEE curricula. Triangulation of the data in this manner assisted in reducing the risk of chance associations or systematic biases due to a specific method, such as observations (Maxwell, 2013).

Following the completion of observations of each MWEE field interpreter, one semi-structured, one-on-one interview was conducted with each individual, each which lasted between 16 to 35 minutes. Only one interview was deemed necessary in order to reach data saturation. To obtain the participants' perspectives of how they define, recognize, and address student engagement, along with their previous experience with environmental education, questions developed by the researcher and the researcher's committee, were utilized to guide each interview (Appendix A). These interviews took place at the Fairfax Campus of GMU and at coffee shops and bookstores around the field investigation sites and GMU. All interviews were conducted and audiotaped by the researcher. Following data analysis, member checks were sent to each participant to reduce researcher bias and increase validity.

Data Analysis Approach

Field notes from the researcher's observations of the field interpreters and audiotape gathered from the participant interviews were transcribed and coded. Due to the phenomenological qualitative design of the study and a lack of similar pre-existing

studies, an open coding strategy was utilized where the researcher developed codes as they emerged during data analysis. Anticipated codes included the recognition of the emotional, behavioral, or cognitive dimensions as well as the impact of influential factors on student engagement. Following analysis, common themes were generated and utilized to address the research questions.

Findings

Description of Participants

When asked if they associated anything about how they were brought up with their interests in working as a field interpreter for the MWEE program, every participant cited outdoor experiences where they interacted with nature and the environment as the most influential factor. Furthermore, they referred to their parents and close friends or family members as role models who inspired their interests in science and conservation. Some participants recalled that they had always had an interest in working with and educating children. Finally, eleven of the 12 participants possessed an academic background in science and/or environmental education.

The majority of the participants became involved with the MWEE program when they read an email sent out by GMU's Environmental Science and Policy Department, which advertised the need for MWEE field interpreters. The remaining participants were either recruited by a GMU professor or by a friend who was already involved with the program. Furthermore, the participants decided to become involved with the MWEES because they were interested in a program which focused on environmental science and education, were looking for a job that gave them field experience, were interested in the

opportunity to work with kids, or because it was convenient and worked with their class schedules.

Finally, although none of the field interpreters possessed formal training or an education degree, half of them had previous experience in environmental education. Experiences the participants recalled included when they developed a lesson or curriculum for an environmental education program or taught an environmental education lesson or class. The other half of the participants did not possess any previous experience in environmental education, however some of them had earlier experiences teaching others. Overall, it can be discerned that the MWEE field interpreters who participated in this study come from a multitude of backgrounds and possess a variety of environmental experiences and interests.

Influential Factors

Throughout data collection, it became immediately apparent that in the action phase of the MWEE, student engagement is often influenced by a variety of novelty factors. Participants listed the environment, field interpreter's approach, academic and physical preparedness of students, chaperones, and other students as examples of influential factors. Not only were these data gathered from the question "What factors do you believe impact student engagement in the field?" but they were also repeatedly interwoven into the participants' responses to all other interview questions, as well as recognized during observations. Therefore it is important to keep each of these factors in mind as you read through the remainder of this study.

Environment

Weather was one of the most commonly reported influential and challenging factors regarding student engagement. The field interpreters widely recognized that the students were less engaged and focused when it was too hot, too cold, or too wet. Jess recounted the impact extreme weather can have on student engagement:

...One day, I don't know why they didn't cancel. It was a bad one, it was cold, it was raining, it was miserable. I mean we were all dressed prepared, we had layers on and our special gear and my water wicking pants and I was still in terrible shape. ... By the time they got to my station, like the third rotation... at that point, the water, their papers, their little notebook papers [were] soaking wet, they couldn't write anything down. So we were just telling them stuff about each station and they didn't care, they were miserable! ... At that point you can't teach them anything...

Aside from such extreme cases, the negative impact weather had on student engagement was not a factor if the students were prepared and dressed appropriately. Prepared students were described as those who wore fieldwork appropriate clothing, such as long pants, layers, and waterproof boots. These students were physically more involved and interested in each activity. Participants, like April, also described how the lack of control they have over the weather can lead to emotionally disengaged and frustrated students,

...If it's raining and the water level has risen, then it's not safe for them to go into the water, then they have to be stuck just working with the animals that we collected in the morning. So then they get discouraged ... or they get really sad that they can't be as involved as the other students...

Another environmental factor participants mentioned were the animals in the park. Sometimes these were park visitors with their pets, but usually students were distracted by park wildlife. The geese at the Burke Lake MWEE site are known for their curiosity and some field interpreters recalled moments where they shooed the geese away so that

they would not distract the students. However, other field interpreters, like Joey, described how they would use the wildlife to their advantage,

...If we're looking for tree bark or something like that and an owl swoops in, well we're going to start talking about the owl because that's the teachable moment. That's where the interest is, that's where the kids energy is, and if you don't go with that, you're asking for a fight and you're not going to have the most Meaningful Watershed Educational Experience you could...

The ability to recognize these teachable moments and build potential distractions, such as park wildlife, into the lesson requires field interpreters who are flexible and able to be cognizant of where the students' interests lie.

In some cases, the environment or terrain impacted students with decreased mobility. As a meaningful Bay experience, MWEEs are for all students. Thus, it is common for students with special needs to attend the MWEEs. Some of the field interpreters reported these students as having decreased mobility and difficulty traversing areas where the terrain was more rugged. To accommodate and engage these students, field interpreters used alternate strategies such as bringing macroinvertebrates to the students at the Biology station, instead of having the students move to the streambed or macroinvertebrates.

Field Interpreter Approach

Half of the field interpreters described their personal approach while teaching a lesson as one of the most influential factors on student engagement in a field setting. It was acknowledged that the students often fed off of the instructors' personality and attitude. Therefore, as found in the literature, the more enthusiastic and entertaining that

the field interpreters were, the more excited and engaged the participants tended to be. Cece explained that an important part of engaging the students and keeping them engaged was based on the approach she used,

...You have to make it fun too, so I'm not serious the whole time ... if it's really cold, I'll make them do jumping jacks and [say] "all right guys, let's just loosen up!", I try to make a friendly relationship between us ... and then I feel like they're more inclined to listen to me after that...

Academic Preparedness of Students

The FCPS and PWCS MWEEs are taught in school systems where the academic abilities of the students vary greatly. Additionally, some schools and students are more prepared than others. This may be due to the rigor of the preparation phase for those students or based on the time of the year. For example, students who attend the field investigation in the Fall MWEE season may not have covered the watershed curriculum in school yet, or students who attend in the Spring season may have learned the material earlier in the year and no longer recall the watershed lessons. Phoebe explained the difficulties that arise when students are not prepared academically,

...When you've got kids that don't know the difference between a woody plant or a grass when they hit the field, you have to then spend the time telling them that, educating them so that they can recognize it to report it. If they don't have the background, to a half an hour, to learn all that stuff and record it, they can't succeed. You're setting them up to fail. So they need adequate classroom preparation. If the goal is to have them engaged directly in the data collection, then they need to be educated about the types of data, not just the types but all the individual elements in those types, what might they encounter there, what should they be looking for, how should they record this...

Field interpreters described students who were academically prepared for the MWEE as more confident, involved, and engaged overall, which correlated with pre-existing research.

Academic preparedness also played a role with regard to engaging English Speakers of Other Languages (ESOL) and Special Education (SPED) students. These students may not be as knowledgeable about watershed, so, as Jess explained, some field interpreters took a different approach when teaching them the station,

...If it's a Special Ed class, I'm not going to go into terminology about pollution. They're not going to get it at all. I'll give them a net and they'll go into the water and they'll start looking for stuff. That's cool, that's something we can work with...

Physical Preparedness of Students

Both FCPS and PWCS have MWEE models that typically run from 10 o'clock in the morning to noon. Around that time on a normal school day, sixth and seventh graders have usually either eaten or are eating lunch. Therefore, it was not surprising that some field interpreters described how hunger frequently impacted the students' engagement. Additionally, some students attended the MWEE without eating breakfast beforehand, which compounded the problem. Field interpreters described students who were hungry or thirsty as distracted and not paying attention. Monica expressed that unless the students were highly motivated, it was nearly impossible to keep them engaged when they were hungry. Over the years that the MWEE models have been running, providing students with snacks halfway through the day has been developed as

a remedy to reduce the influence hunger has on student engagement. This was seen during each observation and in most cases seemed to resolve the problem.

Chaperones

As a field investigation, which takes place outside of the classroom, schools are required to bring chaperones. Generally there are one to two chaperones for every group of 10 to 12 students. These chaperones are responsible for helping to maintain control over the group while the field interpreters are responsible for teaching their lessons. In most cases, participants reported chaperones as being helpful and engaged in the activities.

...I tell them “keep them corralled, you stand over there, make sure they don’t go past that point, push them this way down the stream.” I’ve got some pretty good feedback, especially from the older chaperones, “the fact that we kind of got to participate, it was kind of neat.” [They] didn’t have it as a kid, but [they] can help anyways. I had dad’s running in the woods ID’ing trees once for Biodiversity... (Jess)

In other cases, field interpreters described chaperones as being there to “be a warm body” or are looking at or talking on their cell phone. Overall, the perceptions of chaperones were that they were supportive and had a positive impact on student engagement.

Other Students

The final influential factor of student engagement was the students themselves. As reiterated by many of the field interpreters, the personalities of the students in each group always varied. Some students were excited and ready to learn, while others were unfocused or the jokesters of the group. Field interpreters reported doing their best and

using a variety of strategies to control disruptive behavior. These strategies will be described later in this paper.

Emotionally, Behaviorally, and Cognitively Defining Student Engagement

As previously mentioned, this study defines student engagement as the quality of effort invested by both students and their field interpreters with the intention to improve the field investigation experience and enhance the learning outcomes and development of students, as well as the performance and reputation of the MWEE program (Hu & Kuh, 2001; Trowler, 2010). To answer the first research question and understand how the participants' define student engagement, each field interpreter was asked, "How would you define student engagement in a field setting?". Overall, participants defined student engagement as how the students connected to the MWEE across the emotional, behavioral, or cognitive dimensions of student engagement as well as how they themselves appealed to each dimension.

Emotionally

Trowler describes students as emotionally engaged when they display affective reactions such as interest, enjoyment, or a sense of belonging (2010). In their definitions of student engagement, ten of the participants recognized when students were emotionally engaged. Field interpreters defined student engagement as students who were enthusiastic, interested, excited, and enjoyed learning and being outside. Jess described how she attempted to appeal emotionally to the students by getting them to connect to the park through a sense of belonging, "[I would say things] like 'hey guys, this is your watershed, this is your park.'"

Behaviorally

When defining student engagement in a field setting, the behavioral dimension was described the most, with each end of the spectrum being recognized. Again, Trowler defines the behavioral dimension of student engagement as students who comply with behavioral norms, like attendance and involvement, and refrain from disruptive or negative behavior (2010). Students who were behaviorally engaged during the MWEE were described as active, involved, hands-on, paying attention, writing things down, and following instructions. Some of the interpreters defined student engagement by their observations of how the students interacted with a specific station. For example Rachel recalled, "...with Land Use I have to get them to volunteer a lot. So if they volunteer, then I know they're pretty engaged..." Additionally, Cece explained the behavioral engagement differences she witnessed between different stations she taught,

...I've noticed with some stations, like sometimes when I do Land Use at one place it's just like kind of boring because that's slower because I'm lecturing. But then Biology is so much more fun because it's hands on. They're in the water, so they're really into it then...

The way students interacted with the environment was also often cited in the participants' definitions of student engagement. Jess described how she incorporated the way she learned in high school from her environmental role models, into how she instructed the students,

...What I remember from classes in high school and before was the stuff we did, things you got to touch, things you got to poke at. ... I couldn't tell you what unit we were on number wise, what page in the book, but I remember stuff you know? And I feel it's the same way with these kids....

A few of the field interpreters defined student engagement from their recognition of students who were behaviorally unengaged. Meredith explained that at times, the age group of the students negatively impacted student engagement because they were more interested in talking as opposed to getting physically involved. Monica, a field interpreter who usually taught at the PWCS MWEE sites tied in the impact MWEE locations can have when she defined student engagement, "...I teach in Manassas as well and one of the locations we have right next to the school. So if the children are out during recess the kids are, you know, very distracted, I mean they're not paying attention..." Overall, Monica's response provided a good summation of the general perspective held by the participants when asked to define student engagement in a field setting,

...The student engagement can be a little bit um, diverse. There are some students who are, you know, very engaged, but it can also be very chaotic at the same time. It's an outdoor setting, there are no walls where the students know that we have to be confined in these walls ... student engagement is definitely something that comes and goes and something I always have to pay mindful attention that I need to keep my students engaged because there's so much distraction, these are big watersheds, these are big parks ... keeping them engaged and focused that was always challenging...

In her definition of student engagement, Monica perfectly illustrated what makes MWEEs a unique educational experience. They take place outdoors, in a setting without walls and filled with uncontrollable distractions. Taking into consideration the setting and influential factors on a MWEE, field interpreters have to make the conscious effort to ensure students remain engaged with the lesson.

Cognitively

The cognitive dimension of student engagement is defined as students who are devoted to their learning, seek to go beyond the requirements, and enjoy challenging themselves (Trowler, 2010). Nearly half of the participants recognized this dimension of student engagement in their definitions. Most of them cited engaged students as those who were asking questions and developing answers. Cristina explained how she integrated appealing to the cognitive dimension of student engagement with her teaching style,

...I found when you kind of go off script and let them ask the questions, they pay more attention. So I kind of give them a basis and may ask them a question or two but then I let them ask questions and they seem to be much more engaged than if you just talk at them. ... they start asking questions like ‘what does a macro actually look like?’ ... and ‘oh I’m going to find these, I’m going to be the one to find the coolest thing or find something different...

The MWEE field interpreters’ definitions of student engagement detailed and highlighted the student component. Participants recounted examples of students who were emotionally, behaviorally, and cognitively engaged or unengaged within their definitions. However, this study’s definition of student engagement places equal weight and responsibility on the role of the field interpreter. While some of the responses included how the field interpreters appealed to each dimension, they rarely cited their role as having equal footing with the students when defining student engagement in a field setting.

Emotional, Behavioral, and Cognitive Recognition of Student Engagement

The field interpreters’ definitions of student engagement included how they recognized students who were engaged emotionally, behaviorally, and cognitively

during the MWEE. Those definitions correlated to the participants' responses to the interview questions, *When you are teaching a MWEE, what would you say is your most effective way to engage the students?* and *What have you done that does not work to engage the students?*. Participants' recognized and provided examples of when students were engaged and unengaged across all three dimensions of student engagement.

Emotionally

Students who were emotionally engaged were recognized by about half of the participants and were frequently described as excited, enthusiastic, and having fun. Field interpreters remembered being able to read the students' body language and witnessed the excitement build as they reacted to the opportunity to become physically involved with the experiments. Lorelei recalled an instance when a student responded emotionally while conducting observations at the Water Quality and Habitat station, "...One child was very excited when he found a spot of oil on the water because it was after the rain, so he saw that it was pollution and he was very excited about that. You can see that..."

While field interpreters recognized and provided a handful of examples of emotionally engaged students, emotionally unengaged students were rarely commented on. During the interview process only Rachel described an experience she had with an emotionally unengaged student. The student initially stood out to Rachel because she was displaying behaviors reflective of disengagement. She was sitting down and did not want to get involved with the experiment. Rachel recalled,

...When I see a student like that, instead of trying to force them to work with us, I just, I kind of just let her do her own thing. I understand,

sometimes you're not in the right mood. I like to give her the benefit of the doubt... I went over and talked to her and she was just telling me she wasn't feeling well. ... At the end of the day she told me she had the best day ever and that she loved my station and she did learn, she was taking notes, she was sitting and listening from a distance. So sometimes if they're just not having it, then I can't force them to. It makes them not want to do it anymore...

Rachel initially recognized the student as behaviorally unengaged, however did not connect that she was emotionally unengaged until she took the time to talk with her. By taking the time to talk to the student individually, Rachel was able to get her to reengage emotionally with the field investigation.

Behaviorally

When asked how they knew when students were and were not engaged, every participant recognized both ends of the spectrum of behavioral engagement. Students who were behaviorally engaged were described as paying attention, listening, writing and recording data, following instructions, using station equipment, and interacting with the environment. These students were actively involved with the station lessons and interpreters, which each of the participants picked up on.

With regard to recognizing when students were not engaged, the behavioral dimension of student engagement was described the most during interviews. Participants described unengaged students as those who did not listen or pay attention, looked around, talked to each other about unrelated topics, did not participate in the lesson, wandered off, or complained. As previously explained, there are an abundance of influential factors during a MWEE, which can distract the students during a field investigation. Addison described unengaged students as "...the boys jumping in the river

and throwing rocks and ‘[look] oh a butterfly!...’.” Additionally, Joey exemplified how those factors can have an impact with his response, “...they’re chucking rocks, throwing sticks, laughing, picking branches off of trees, you know, not looking at me...” As previously described by Monica, during a MWEE field investigation students are not confined by walls. The MWEE sites and parks are large and filled with distractions and it is up to the field interpreters to keep their students engaged.

Cognitively

During interviews, almost every participant also used cognitive terminology to describe engaged students. Cognitively engaged students were most often labeled as those who asked questions, answered questions, and challenged themselves during the lesson. Meredith recalled that she knew these students were engaged because they did not ask questions that she had already explained, but instead formulated their own questions and asked things that needed to be asked. When she taught the Biology station, Jess remembered how students would frequently challenge themselves to find a macroinvertebrate that was different or unique from anything else they had seen.

Similar to the emotional dimension of student engagement, the cognitive dimension was also least recognized when asked how interpreters knew when students were not engaged. Out of the 12 participants, only Miranda and Monica mentioned cognitively unengaged students within their responses. Miranda stated that sometimes the unengaged students did not answer questions, which she affiliated to bad weather and the negative impact the environment had on student engagement. Monica described unengaged students as those who asked unrelated questions, “...[If they] ask something,

something very irrelevant, I'm talking about water quality and they're going to bring something totally not relevant to the whole MWEE or to the whole watershed thing, that tells me that they're not [engaged]..."

Overall, whether students were engaged or unengaged, the field interpreters were able to recognize and provide examples for all three dimensions of student engagement. However, it was clear that the behavioral dimension of student engagement was the most recognized and reported for both engaged and unengaged students.

Previous Training and Teaching Styles

While many of the participants had years of experience teaching science courses and developing or running environmental education programs, none of them were formally trained or possessed an education degree. Furthermore, training to become a field interpreter for the FCPS or PWCS MWEE programs, does not involve lessons or courses on how to teach the students. Currently, MWEE training involves a one hour orientation, two hours of field training, and one hour of environmental field safety training. Participants who attended orientation recalled learning about the MWEE program and being recruited that day to become field interpreters. Field training took place at one or more of the MWEE sites so that the field interpreters could get a realistic idea of how a typical MWEE day would go. On this day, field interpreters remembered learning the curriculum and being shown how to set up and teach each station. Many of the field interpreters recalled this day as being useful, but still had minor insecurities and difficulty imagining how an actual MWEE day would play out. Finally, the hour of environmental field safety training was described by some interpreters as necessary, but

did not provide new information, because it was mostly common sense to some of the participants who had years of fieldwork experience.

Aside from attending the required MWEE training days, when asked how they prepared or trained to become a field interpreter, the participants stated that they read the MWEE curriculum online, learned from their MWEE coworkers, or did nothing because they already possessed years of environmental education experience and felt prepared. Field interpreters that possessed pre-existing experience had academic backgrounds in science, years of experience teaching or tutoring, done fieldwork or research before, or had siblings or children of their own. The years of experience these field interpreters brought also provided some of them with strategies for achieving and maintaining engaged students. Typically these participants described preparing for the MWEE by reading through the curriculum and learning the stations and their corresponding key points.

A majority of the participants described learning from their fellow MWEE faculty as one of the best ways to learn to become a field interpreter. Participants, such as Cece, who had the opportunity to shadow or team teach with a more experienced field interpreter, described it as really helpful and the best way to learn,

...I went to the training they do, but I don't think I learned as much from that as I did from watching someone do it. ...learning from that girl, I just adapted her technique ... I'm basically using her outline...

Unlike Cece, Miranda did not have the opportunity to work with a more experienced field interpreter before she taught her first MWEE. However, she found talking with her fellow interpreters to be just as useful,

...We do also talk with each other about our experiences... We discuss what we did in the field... We discuss about how we solved that problem,... that's how I learned about, you know if there's somebody distracting the group, so how you can take that person out and then ask him the question specifically and then he would kind of mellow down, so those strategies and things and what you learn from everybody else and then you put it to practice...

None of the field interpreters received special training to know how to keep students engaged. However, like Monica, most of them found it helpful to compare notes with others field interpreters to learn how to engage the students,

...[Student engagement is] something we learned over time. ...I didn't go through any training for that part. ...it's eight or 10 of us working in the field right? So after the end of the day we exchange notes, 'How did it go for you? This is what happened. Okay, my students were not engaged. Yours were engaged? Oh wow, what did you do?', those kind of things. I think that helps all of us. ...this is what made me a better field interpreter after two years...

In addition to learning from other field interpreters, many of the participants cited Cindy Smith, an integral staff member responsible for the GMU MWEE field interpreters, as an excellent resource for learning how to keep students engaged. Many of the field interpreters not only remembered some of the strategies and techniques Cindy taught them, but continued to incorporate them during the MWEEs they taught this past season. Lorelei recalled a strategy Cindy told her to help the students better conceptualize the watershed concepts,

...It was very, very good advice that I think Cindy gave us, 'pretend that you are a very tiny creature'. So when kids started to think about it, it's from a very different point of view, they started to be more engaged because they tried to realize what [macroinvertebrates] think, what they feel...

Meredith and Cece also both described examples of when Cindy helped them use different approaches to effectively engage the students emotionally, behaviorally, and cognitively. Meredith explained that "...Cindy really let us know it was important to you know, ask each of them a question or have each of them do a task and I feel like that was effective...". Furthermore Cece cited Cindy's advice to take advantage of the teachable moments as they are presented in the field,

...I think Cindy was really good. She told us not to focus on the information... she's like 'if you find something cool, just talk about it' because that's what they're going to remember, they're not going to remember their packet lesson. Because if they were just recording, then you're not going to remember as much if you actually [are] doing it...

Lastly, a few of the participants who had less experience teaching and working with children mentioned that they would have liked to learn strategies for handling students who were unengaged or disobedient. Overall, it was widely admitted that regardless of any training, the best way to improve one's ability to teach and engage the students was through years of experience as an environmental educator or field interpreter.

Eleven of the 12 field interpreters described their teaching style as a mixture of planned out and spontaneous based off of their previous experience as environmental educators, what they learned from the training they underwent to become MWEE field interpreters, and the aforementioned influential factors of student engagement in a field setting. Each of these 11 participants acknowledged that their MWEE teaching style is partly planned out due to the curriculum's mandated key points, which they must address, and the data the students need to collect. However, aside from their basic pre-

planned lectures, many of the field interpreters explained that because of the uncontrollable influential factors in a field setting, their teaching style was also partly spontaneous. Such factors included questions the students asked, the impact the weather had on the site, the wildlife present, and the variations in education or energy level of the students. Addison explained how she enjoyed the spontaneity and transformation of the discussion that came with the variety of questions students asked,

...So you never know what questions are going to pop up... Sometimes questions come out of left field and you're like 'well that is just a great question!' and it's something that you maybe wouldn't have thought to address and so those are the really exciting times...

Furthermore, Cristina described how she altered the structure of her lesson based off of how she gauged the students' academic level,

...in Fairfax the students come and nine times out of 10, they know everything, every question you can ask. So I'll ask them harder questions or get them a little bit more in depth. There [have] been times at Prince William when they come out and they have no idea what you're talking about, so you have to spend more time talking and you have to spend more time on the basics...

The twelfth field interpreter described her MWEE teaching style as more planned out and attributed it to her lack of experience with the program and English not being her first language. When she prepared to teach as a field interpreter, she recalled writing down and memorizing the portions of the curriculum that she wanted to tell the students. Regardless of the type of MWEE teaching style that the participants described, each individual had adapted a technique that worked best for them.

Effective Strategies Employed to Engage Students

As mentioned, none of the participants possessed previous formal education or training to learn how to teach. Therefore, when asked *When you are teaching a MWEE, what would you say is your most effective way to engage the students?*, each of the interpreters had their own unique responses. While the participants did acknowledge that these strategies were dependent upon the students' needs and interests, some of the common themes that emerged were the establishment of an interactive energy level and the approach to engage them either cognitively or behaviorally.

Interactive Energy Level

Half of the field interpreters described that when they developed a more interactive energy level while they taught, the students were more likely to become engaged. Examples of this approach included being enthusiastic, energetic, and louder than the students. Joey described how he always greeted the students with energy and a smile, but balanced his approach with a brief introduction to set the tone for how he expected the students to behave,

...Just immediately right off the bat, bring the kids in and get them to circle up right away so we can all see each other. And really being kind of tight at the beginning as far as you know, "I'm going to talk, but when I'm done talking it's all you guys, I'm not going to talk that much." So if you start off tight with the kids, you can always loosen up, you know if you start up loose, you're going to battle and it's only you know in some cases 15 minutes, 20 minutes in a rotation. That's not a lot of time to cover a lot of information... establishing that "look, I'm running this, let's go for it, let's get as much as we can out of it and have some fun and get out of here"...

Rachel explained how the use of her energetic personality to excite and engage the students stemmed from her experience the first day she taught MWEEs,

...if I am louder and if I have more energy than them, then they will instantly get to my level. If I'm really quiet or if I'm tired, like towards the end of the day, they'll be the same level as I am. ...my second group ever, my first day... these students came in, they were obviously friends and were kind of rowdy. I didn't think they'd want to pay attention and then they all sat down and wouldn't listen and I just literally yelled. I was just like "Hello everybody!" and then they all just looked up at me and they were like "Yeah?" and I just kept going really loud, I was really excited and they all just got really excited...

Rachel continued to recount how the initially unengaged students began to answer questions, volunteer to complete tasks, and at the end of the day both the students and chaperones thanked her because she was their favorite station. She ascribed the positive feedback she received from the parents and students as what kept her involved with the program.

Cognitively Engaging

Over half of the field interpreters reported that appealing to the students cognitively by asking them questions was an effective strategy that they frequently implemented. At times participants asked students questions to get them to think outside the box and wonder "Why?". Other times, participants like Cristina probed the students to ask the questions themselves,

...You always have one or two students in a group that have questions, but in all actuality almost all of them will have a question. So if you just go around and ask a person, '... if you could ask me anything, what would you ask?', students actually will ask whatever they were thinking that they were too shy to ask beforehand and that will pull a lot of people out of their shells and want more...

In some cases, Cristina recalled how by cognitively engaging the students, she was able to behaviorally engage them as well.

Behaviorally Engaging

Participants reported a variety of effective strategies that they used to behaviorally engage the students. Examples of this included when they provided clear instructions, gave the students specific tasks, or had them interact with the environment. Some of the participants recalled that they gave students tools to conduct the experiments and ensured everyone had a chance to use the equipment. While other participants, like Miranda, engaged the students by making them responsible for a specific part of the lesson,

...this last season... there was a little boy... and he didn't want to do anything. He was just not interested and I said '...I'm going to keep you in charge of doing this particular experiment because only one person can do it.' I was like 'You're out here, you should try something. Just try this one for me.' So he finally in the end he just, you know, he did it.... It was something he was supposed to do but he kind of enjoyed it at the end...

When she taught the Biodiversity station, Phoebe discovered that getting the students to interact with the environment was an effective strategy to engage them,

...when we would go into the woods and I would say, '...who can be quiet for two minutes? Let's be perfectly quiet and let's listen and let's see how many things we hear.'" I found that to be good. ...a lot of times that had the kids most directly, when their eyes were closed and their ears had to focus on what they're hearing... then that was I think effective...

Regardless of what approach they implemented, all of the field interpreters recalled effective strategies that worked for them to engage the students during a MWEE.

Ineffective Strategies Employed to Engage the Students

An enormous variety in responses emerged when the participants were asked, *What have you done that does not work to engage the students?*. Common themes that arose included lengthy lecturing, poor time management, and misuse of voice.

Lengthy Lecturing

Talking too long or too much about a subject was the most frequently reported strategy that was described as ineffective for engaging students. Miranda recalled the first time she taught she overloaded the students with information, which she found to be ineffective because they were so overwhelmed with the information that they no longer understood what was happening with the lesson. Furthermore, she compared and contrasted the FCPS and PWCS MWEE programs to highlight how she had to learn to balance the amount of information she provided the students with the amount of time she had for the lesson,

...When I teach in Manassas, they have longer stations and they have only three stations, so we get to go over each concept and tell them in detail. When I come to Fairfax, ...I expect to give them a little bit of background, but there isn't much time. So I'm kind of hurrying up and all they're getting through is information, information, information. ...it's an adjustment I've had to make and I think it's working out. ...with longer stations, I remember I was kind of going over each of the concepts, pH and turbidity and so the children kind of disengaged because they were getting too much information...

Poor Time Management

Two participants recalled how poor time management, whether they were inflexible with their time or too flexible, often led to students who were unengaged in the activity. These participants described how important it was for field interpreters to always have an awareness of their timing and to remain flexible in case influential

factors, such as late buses, reduced the length of their lessons. Jess explained how going by the book or being inflexible could lead to a missed teaching opportunity,

...Don't rely on any schedule because the second a frog jumps into their line of sight, everything goes out the window. So I mean, you can't go on with the special little pre-prepared speech, you just can't. Every group I've said something slightly different or maybe switched the order on two things if it made more sense for that group. ...because if they find something ridiculous on the table from another group... they're like 'What is that?'. Let's not start with 'Hey guys, welcome to..' [instead say] 'okay guys, since you're so interested in that, [it] is a so and so...', you got to adapt...

On the other hand, Cristina recalled a personally frustrating incident that occurred when she was too flexible with her time at the Macroinvertebrates station and students became behaviorally unengaged,

...We give them a little bit of direction and I like to give them as much time in the water and looking for things as they can. However I found that if you give them too much time, they lose concentration and start playing and you end up with someone in the water...

Misuse of Voice

Some of the participants explained that when they did not use their voice to their advantage, students were less likely to be engaged. April stated that influential factors such as the water, other students, and other stations had the occasion to be loud and distract the students. So, April had to make sure she projected her voice in order to prevent students from becoming unengaged. Joey highlighted the importance that the way field interpreters used their voice, had a strong impact on whether or not the students were engaged,

...Not change my voice you know from either loud ... or just to have a monotone voice just doesn't work. ...if you really lower your voice, you

see the kids come in... Voice is a really powerful tool and if you don't use it well, that's probably the worst thing to do...

Emotional, Behavioral, and Cognitive Responses to Engaged Students

When they witnessed students who were engaged, most of the participants responded in one of three ways. Either they appealed to them emotionally, challenged them behaviorally, or challenged them cognitively.

Emotional Response

A few of the participants explained that when they saw students who were engaged, they would praise or verbally reward them, over-compliment them, encourage their behavior, show that they were excited for them, and generally made the students feel special. Cece described how she emotionally appealed to engaged students, "...If somebody finds something really cool, I'm like 'Everybody! Look what so and so just found!'. I try to make them, so that's their moment... and then everybody comes around and that person's really excited that they did that..." Additionally, Rachel highlighted how she excessively praised and complimented students when they demonstrated that they were engaged,

...I over-compliment them, so much... someone who's like really engaged or like really excited about it, I like to stop [and say] "Wow, I'm really impressed by your answer, I'm really impressed that you knew that, keep it up, you're doing really good"... I like to cover them in praises and make them feel special...

As explained by the literature, when students received praise and felt that their teachers cared about them, their learning and engagement were more likely to increase.

Behavioral Response

Jess was the only participant to cite that she responded to engaged students by challenging them behaviorally. In her explanation she referred to a variety of teaching approaches she utilized when she was at the Biology station,

...I'll be like, "Show me something I haven't seen before!... Find me a leach. Find me some stuff we can't find that often!"... I'm always telling guys, "Dude, your last group found this, this, and this, you all have to do better than that" and they're like "Okay, we can do better than that. I can find that!". I'll egg them on, it's like "Are you guys smarter than a fish? Are you sure? Because [they are] going to be eating some of this stuff. You got to out race them!" and they're like "Okay, yeah I'm smarter than a fish!"... you know, make it a little competition..."

Jess used techniques, such as friendly competition, to behaviorally challenge the students who were engaged and hopefully engage the others who were not.

Cognitive Response

Most of the field interpreters stated that in response to the students who were engaged, they would attempt to further challenge them cognitively. For example, April recalled how she would probe students to further explain the reasoning behind their answers, which then evolved into new discussions,

...sometimes I'll ask them why they think what it is that they think and then they give me their explanation, and it's really interesting to hear their reasoning, and if their reasoning is a little bit off... I don't discourage them... [or if they are right] I'm like "That's great, that's really great"... and I'll build off of whatever they say... it's just discussion based..."

Furthermore, Miranda described how she would challenge the students to think of solutions for the environmental problems they encountered,

"...we talk about those concepts a little further, to give them more information as to... try to get them to think, try to get them to solve problems...[it] kind of like feeds one thing into another and then they get the concept or the big picture..."

Regardless of the approach each of the participants' implemented in response to students who were engaged, they all observed that not only did their strategy enhance the learning experience for the engaged students, but it also led to an increase in engagement for other students.

Varying Responses to Unengaged Students

When asked how they responded to students who were not engaged, field interpreters reacted in three ways. Either they responded to the students verbally, attempted to get them active and physically involved, or were unsure of how to respond.

Verbal Response

All of the participants described various ways that they verbally addressed students who were unengaged. Examples ran the gamut from correcting their behavior, to encouraging them to refocus, to asking them specific questions, to singling out the unengaged individuals, and finally to embarrassing them. Miranda recalled how she utilized the nametags the students wore to her advantage in addressing individuals who were not engaged,

...I take their name because they always have their tags... and then I kind of ask a question to him and try to make him answer... I try to get each one to pay attention. Especially if someone, one of the group members is distracting everybody else, I kind of pick on them, I kind of point them out...

Rachel also responded to unengaged students by addressing the individual, however she used a slightly different approach,

...I do two things. The first thing I do, I'll single them out... like "Hey, I need you to pay attention. We've got a little amount of time, we've got to

keep going.” And if that doesn’t work, then I embarrass them. Usually when one person is being defiant and everyone else is really engaged, they will work with me... if I get the other kids on my side it really works really well because then they’re like “Ah, clearly I’m doing something wrong.”...

While Rachel described how she reprimanded individual students who were unengaged, Addison highlighted how she attempted to switch the focus back to the lesson in an effort to reengage those students, “...[I] try putting the focus back on the task... sometimes you get just the students that don’t want to participate... but I’ll keep encouraging them...”.

Get Them Physically Involved

Many of the field interpreters attempted to reengage students by getting them physically involved with the MWEE. Participants’ responses included making the students their personal assistants, giving them a specific task, attempting to remove any distractions, showing them something interesting, ensuring they established a physical connection, and accommodating individuals with special needs. It was discovered that each of these approaches reengaged the students both behaviorally and emotionally.

Although observations found that many participants turned unengaged students into their personal assistants during the field investigations, only Jess described this approach in her interview,

...I turn them into my own personal assistant... if they’re really squeamish... if it’s just a smooth stone or something, I’ll get them to hold it... the snails are the easiest for them to get a hold of or the clams... I’ll put them on his hand and... tell them to go show everybody what you found. That way you have something to get involved with... be like “Look, I found this!”...

Jess described how hands-on, investigative experiences, where students established physical connections with their environment, are more likely to be remembered by children as they become older. Furthermore, Joey explained how he integrated novelty factors in an effort to reengage the students,

...I'll have something cool and I'll say "Hey, what's this? You know what this is?... Have you ever seen something like this?", and that cool thing might be... a little critter you know, or a skull... and you know that's going to change the game hopefully...

Finally, April recalled an instance when she accommodated a student who was uncomfortable participating in the experiment,

...I do some little accommodations because we do go in and get animals, but... one time one student was like "I don't feel like it's right to pick up animals if they don't come to me", and I was like "Okay, that's perfectly fine. I'm not going to force you to do this." So I had him do an alternative thing where [he took] water from the stream and put it in the animals that we did have. So he kept the oxygen flowing and I just... had a little mini lesson... It was a good alternative I think and he loved it... he felt useful, helpful, excited about just putting water in there... and felt important...

Unsure

As mentioned, some of the field interpreters were unsure of how to respond to students who were not engaged. When asked if she felt if her verbal responses to unengaged students were effective, Meredith responded, "...Yeah, I don't know what else to do..." Furthermore, Monica, an experienced field interpreter, expressed frustration over experiences when she was unable to engage her students,

...I have had groups where you know, after talking 20 minutes, I'm like "This was a total waste of their time, I don't think they got anything out of these 20 minutes." ...it's learning for me... when you have that group of... where after teaching for 20 minutes you feel like you haven't really done your job or you haven't really gotten the point across, the next group

comes and then I'm more prepared, I am more excited and I'm like "Okay, I'm not going to let this happen" because then... it just bogs you down that my kids were not engaged...

The variety of approaches and timeline for implementation as to how the participants responded to unengaged students, as well as the number of individuals who were unsure of or had difficulty responding, highlighted the participants' absence of an educational background. Through trial and error each participant was eventually able to implement techniques that led towards students who were more engaged emotionally, behaviorally, and cognitively.

Discussion

Major Findings

Throughout the course of the study, it was found that the MWEE field interpreters understood and recognized the concept and various dimensions of student engagement. None of the participants possessed professional degrees in education or received special training to know how to keep the students engaged. However, over time and through trial and error they each developed their own effective strategies to address students who were or were not engaged. By investigating the phenomenology of how the MWEE field interpreters understood and addressed student engagement in a field investigation, researchers and program developers can improve the overall effectiveness of the MWEE models and the impact they have on student outcomes.

Research Question 1

In their definitions of student engagement in a field setting, MWEE field interpreters described each of the three dimensions of student engagement. Not all of the participants were able to provide a concise definition of student engagement in a field setting, however they each recognized and provided examples of when the students were engaged across all three dimensions (Assor, Kaplan, & Roth, 2002; Burrows, 2010; Kahu, 2013; Klem & Connell, 2004; Shernoff, Csikszentmihalyi, Schneider, & Shernoff,

2003; Skinner & Belmont, 1993; Trowler, 2010; Yoon, Ho, & Hedberg, 2005). The behavioral dimension of student engagement was the most widely recognized, followed by the emotional, and then cognitive dimensions. Furthermore, in their definitions of student engagement, the only dimension where the field interpreters recognized students who were both engaged and unengaged, was the behavioral dimension.

As previously described, this study defines student engagement as the quality of effort invested by both students and their field interpreters with the intention to improve the field investigation experience and enhance the learning outcomes and development of students, as well as the performance and reputation of the MWEE program (Hu & Kuh, 2001; Trowler, 2010). Throughout their definitions, the MWEE field interpreters detailed and highlighted the student component, however they failed to recognize the equal importance that they themselves have with regard to student engagement in a field setting. Some of the participants briefly described how they appealed to the different dimensions, however none of them placed an emphasis on their role in improving the field investigation experience and enhancing student outcomes. Exact reasoning why the participants did not recognize their equal importance in the process of student engagement remains unclear. Further research will be needed to investigate this discovery.

Research Question 2

To answer the second research question, *Do MWEE field interpreters recognize when students are and are not engaged?*, the responses to the interview questions *Do you know when students are engaged? If so, how?* and *Do you know when students are*

not engaged? If so, how?, as well as observation field notes, were analyzed. Participants recognized and provided examples of when students were engaged and unengaged across all three dimensions of student engagement.

Field interpreters described emotionally engaged students as excited, enthusiastic, and having fun. Behaviorally engaged students were recognized as individuals who paid attention, listened, recorded data, followed instructions, and interacted with the environment. Finally, cognitively engaged students were cited as those who asked questions, answered questions, and challenged themselves throughout the lesson. Each of the participants' descriptions regarding emotionally, behaviorally, and cognitively engaged students strongly reflect what can be found throughout the student engagement and environmental education literature (Burrows, 2010; Klem & Connell, 2004; and Trowler, 2010).

Similar to the findings from the first research question, the behavioral dimension was most frequently described when participants were asked how they recognized students who were not engaged. These students were described as individuals who did not listen or pay attention, talked to each other about unrelated topics, did not participate in the lesson, wandered off, or complained. The field interpreters attributed students' behavioral disengagement to the influential novelty factors, described by Orion and Hofstein (1994), which emerged during the MWEE field investigations. Such factors included the physical preparedness of the students and the environment itself.

Interestingly, out of the 12 total participants, only one of them recognized a student who was emotionally unengaged and only two field interpreters recognized

students who were cognitively unengaged. The field interpreter who observed a student who was emotionally unengaged, initially recognized her because she showed signs of behavioral disengagement. It was not until she took the student aside and spoke to her, that she then recognized the student was emotionally unengaged. These findings illustrate the need for field interpreters to be fully aware of how to recognize all dimensions of student engagement. For example, students may be behaviorally engaged, however if they are not cognitively and emotionally engaged as well, then it is likely that the impact of the program on student outcomes will be greatly diminished. Efforts to educate the MWEE field interpreters on how to recognize all dimensions of student engagement should be taken in order to maximize the impact on student outcomes (Assor, Kaplan, & Roth, 2002; Fletcher, n.d.; Kahu, 2013; Klem & Connell, 2004; Shernoff *et al.*, 2003; Skinner & Belmont, 1993; and Trowler, 2010).

Research Question 3

In order to answer the third research question, *How do MWEE field interpreters address student engagement in the field?*, the participants' responses to the interview questions regarding their most effective and least effective strategies to engage the students, as well as how they responded to students who were engaged and unengaged, were analyzed. These responses were compared to the student engagement techniques and strategies that were recorded during field observations. Furthermore, it must be noted that these responses showed the greatest diversity, which may be attributed to the fact that none of the participants' possessed previous formal education or training to learn how to teach or respond to the dynamics of student engagement. Therefore, they

each had developed their own unique strategies and approaches for addressing student engagement in the field.

Field interpreters acknowledged that their strategies to engage the students often fluctuated based on the students' individual needs and interests. However, common themes that emerged as the most effective strategies to engage the students included the establishment of an interactive energy level, and cognitively or behaviorally engaging the students. Field interpreters employed similar strategies to engage the students, as those found in the existing environmental education and student engagement literature (Assor, Kaplan, & Roth, 2002; Emmons, 1997; Finn *et al.*, 2009; Klem & Connell, 2004; Sivek, 2002; Skinner and Belmont, 1993; Sobel, 2012; and Stern, Powell, & Hill, 2013). For example, they found that when they were enthusiastic and energetic, asked the students questions and challenged them cognitively, or provided them with clear instructions and had them physically interact with the environment, the students were more likely to become and remain engaged.

Even more variety in responses emerged when participants were asked to describe their least effective strategy for engaging the students. However common themes emerged such as talking too long or too much about a subject, poor time management, and not using their voice to their advantage. Only two of the 12 field interpreters were found to continue to implement their strategies during field observations, even though they recognized during interviews that those approaches were ineffective. During these observations, students were visibly less engaged, however the impact on student outcomes could not be known without further investigation.

Field interpreters responded to engaged and unengaged students in a multitude of ways. When they recognized students who were engaged, participants described that they attempted to appeal to them emotionally, challenge them behaviorally, or challenge them cognitively. Their responses not only continued to engage the students who were already focused, but also resulted in an increase in engagement for the other students. Finally, when participants recognized students who were not engaged, they attempted to reengage them verbally, get them physically involved with the station, or were unsure of how to respond. These variations in responses may reflect the lack of, and maybe need for, training to address the dynamics of student engagement.

Comparison of Findings with Existing Studies

What made this research particularly difficult was the absence of similar pre-existing studies. The environmental education literature is filled with studies regarding residential environmental programs and the impact of environmental education on student knowledge, attitudes, and behaviors (Ballantyne, Fien, & Packer, 2000; Emmons, 1997; Stern, Powell, & Ardoin, 2008; and Stern, Powell, & Hill, 2013). However, few studies focus on a one-day environmental educational activity, such as the MWEE, which is integrated into the formal education curriculum. Furthermore, even fewer studies analyze the impact the environmental educators of those programs have on student outcomes. Additionally, the student engagement literature is mainly focused on formal educational experiences as opposed to informal or outdoor education activities (Assor & Roth, 2002; Klem & Connell, 2004; Skinner & Belmont, 1993; and Yoon, Ho,

Hedberg, 2005). Therefore, there was little pre-existing knowledge on the variations and influencing factors pertaining to student engagement in an outdoor setting.

As previously noted, Johnson (2011) conducted a quantitative study on the development and establishment of the PWCS MWEE program. Specifically, he examined the effectiveness of the program from the perspective of the teachers and students, but refrained from addressing the MWEE field interpreters. Given the lack of similar pre-existing literature and the awareness that little is known about the impact that the local MWEE field interpreters have on the programs, it can be understood why an investigative qualitative study was conducted.

Limitations

The main limitation of this study was an overall lack of time. Due to unforeseen circumstances, observations did not begin until the end of the Fall 2013 MWEE season. Therefore, not only were there fewer days to gather observational data, but there were also less potential participants available. Additionally, in October 2013 the government was shutdown and unfortunately the PWCS MWEE sites are in national parks. Therefore, during a majority of the Fall 2013 MWEE season, observations could not be conducted of field interpreters at the PWCS sites. Both of these complications limited the number of available participants for the study and potentially impacted the collection of rich data. Finally, only the researcher was involved in data collection and analysis, therefore researcher bias was also a limitation.

Implications for Future Research

While this study provides insight into how the field interpreters impact the effectiveness of the FCPS and PWCS MWEE programs, a study connecting all MWEE participants has yet to be found or conducted. A complete MWEE begins at the preparation phase with the school's students and teachers, moves to the action phase with the students and field interpreters, and ends with the reflection phase back at the school. In order to fully comprehend how effective the MWEE program is, all three participating groups should be involved in a comprehensive study. A MWEE is defined by all three phases, thus the cohesive impact that the individuals involved in those phases have on the program, should be studied.

Overall Significance of the Study

MWEE field interpreters are an integral component of both the FCPS and PWCS MWEE models and are critical to each program's success. Not only do they engage and interact with the students on field investigations, but they also serve as environmental educators who complement and strengthen the abilities of the classroom teacher. Furthermore, as role models, they impact student outcomes such as environmental knowledge, awareness, and stewardship. Given the significant influence they have on the students who attend the MWEEs, it is vital that the field interpreters understand and know how to appropriately address the dynamics of student engagement in a field setting.

Overall, MWEE field interpreters demonstrated a strong awareness of student engagement. They defined, recognized, and addressed student engagement within the constructs of the emotional, behavioral, and cognitive dimensions. Ultimately, the

individual experiences of each MWEE field interpreter provides insight into the phenomenon, however further research is required to strengthen the awareness of how, if at all, their perspectives of student engagement directly impact student outcomes.

Appendix A

1. Tell me a little about yourself.
 - a. Do you associate anything about how you were brought up with your interest in working as a field interpreter for the MWEE program?
 - b. How did you become involved in the MWEE program?
 - i. Why did you get involved?
 - ii. How long have you participated in the MWEE program?
 - c. Do you have previous experience in environmental education?
 - i. If yes, can you please provide me with more information about your experience?
2. How would you define student engagement in a field setting?
3. When you are teaching a MWEE, what would you say is your most effective way to engage the students?
 - a. Can you give an example of that?
4. What have you done that does not work to engage the students?
 - a. Can you give an example of that?
5. Would you describe your MWEE teaching style as very planned out or more of a spontaneous style?
 - a. Please explain.
6. Do you know when students are engaged? If so, how?
 - a. Do you do anything when you see that? If yes, what and why?
7. Do you know when students are not engaged? If so, how?
 - a. Do you do anything when you see that? If yes, what and why?
8. What factors do you believe impact student engagement in the field?
9. How did you prepare or train to become a field interpreter?
 - a. Did you receive special training to know how to keep students engaged?
 - i. If yes, what training?
 - ii. If no, where did you learn how to keep students engaged?
10. Is there anything else you want to tell me?

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Biography

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