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# Public School Science Education and Geographically-Specific Environmental Sustainability Issues: Implications for Social Work Education

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PUBLIC SCHOOL SCIENCE EDUCATION AND GEOGRAPHICALLY-SPECIFIC  
ENVIRONMENTAL SUSTAINABILITY ISSUES: IMPLICATIONS FOR SOCIAL  
WORK EDUCATION

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Social Work

Honors College Graduate Distinction at Western Kentucky University

By

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Western Kentucky University  
2014

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## ABSTRACT

The focus of this project was to examine the educational practices of Kentucky-based public school teachers (grades 4th-8th) related to their efforts to incorporate sustainability into the science classroom and specifically related to the teachers' focus or lack of focus on karst landscape. The major themes that were analyzed were how educators include this content into their classroom material and how this impacts their students in the area of environmental sustainability. The themes analyzed were: environmental sustainability as a lifestyle choice; education about environmental sustainability, the nexus of family, school, and community; the importance of geographical context in regards to environmental education. This project also explored the implications of this research for Social Work education. More specifically, how this knowledge might inform an expansion of these topics in the Social Work classroom.

Keywords: karst, environmental sustainability, science education, social work education,

Dedicated to my professors, friends, and family who supported and encouraged me throughout this process.

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## TABLE OF CONTENTS

	<u>Page</u>
Abstract.....	ii
Dedication.....	iii
Acknowledgments.....	iv
Vita.....	v
List of Figures.....	vi
Chapters:	
1. Introduction.....	1
2. Review of the Literature.....	8
3. Methodology.....	15
4. Results.....	21
5. Discussion.....	29
References.....	40
Appendices.....	44
A. Informed Consent.....	44
B. Email Scripts.....	50
C. Telephone Script.....	53
D. Interview Guide.....	55

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Karst Landscape in Kentucky	5
2. Karst Landscape	12

## CHAPTER 1

### INTRODUCTION

The environment is a complex system encompassing the natural world and affecting conditions in which interconnected organisms exist and function (Smith, Corvalàn & Kjellström, 1999). Current cultural, economic, and environmental trends associated with human activity are shaping the future condition of the world (Engleman, 2009). Today, environmental problems have reached such dimensions that they are affecting all living things on earth (Jannat, 2011). Ironically, as a result of human choice and behavior, human beings are both the cause of and are effected by, ongoing environmental problems. As a result, human existence is in danger due to the massive environmental degradation caused by human activities (Engleman, 2009). As described by Kilinc as cited in Morelli (2010), “technological developments, globalization, and the increasing needs of human population threaten the natural environment more than ever before” (p.1). For this reason, a dramatic reframing of behaviors, attitudes, and perceptions in regard to the intersectionality of humans and the physical environment is needed in order to re-establish and maintain harmony between the earth and its inhabitants (Dylan, 2012).

As defined by Morelli (2011), environmental sustainability provides a holistic framework that emphasizes the importance of interrelationships and interdependence between the natural world and humanity. In essence Morelli argues that environmental

sustainability reflects a dynamic environment that promotes harmony between humanity and the natural world, “allowing human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by its actions diminishing biological diversity” (p. 23). From this standpoint, there is a need for human beings and the communities in which they co-exist to adopt and incorporate behaviors that support environmental sustainability.

Environmental education can play a key role in promoting increased knowledge and awareness that result in a reshaping of perspectives in order to propel action to alleviate urgent environmental problems (Honeywood, O’Toole, & Pearson 2005). And higher education can play an important role in promoting these behaviors (Honeywood et al., 2005). However, current norms for promoting sustainable growth and development have taken an approach that has largely focused on individual rather than collective behaviors. As a result, at least with respect to higher education, environmental education has focused on strategies that are primarily human centered and rooted in personal responsibility (Honeywood et al., 2005). Therefore, limited progress has been made to promote collective sustainable practices. Additionally, environmental sustainability education in higher education may not be effectively attending to more localized contexts (North, 2012 ).

Further complicating these efforts, Honeywood, O’Toole, and Pearson (2005) note that, “the pathway for achieving sustainability outcomes in environmental education

is littered with difficulty” (p.173) because of ambiguous and often ineffective methods for measuring the impact of such programs as well as a general resistance to change. Ralph and Stubbs (2013) assert that “universities play a fundamental role in addressing global environmental challenges” (p. 71). And, they further argue that through the implementation of research, community involvement, recognition of ecological impact, and fostering inter- and trans- disciplinary teaching, these institutions can foster students’ “thinking about the future in which the economic, environmental and social dimensions are intertwined, not separate, and are balanced in the pursuit of an improved quality of life” (p. 72). Derman (2013) advocates a broader project arguing that “environmental education should be integrated into the *whole* system of formal education (p. 150) (*emphasis added*). In other words, environmental education should include grades K- 12, however, the extent to which this integration occurs in the public school system, in these grades is not clear (Ernst, 2012). Further, whether this integration incorporates more geographically-relevant content on environmental phenomena and sustainability is not known. For instance, in the Kentucky region, karst topography is a distinctive terrain that creates a unique stressor for humans and the environment as a substantial percentage of drinking water is derived from groundwater percolating through fractured limestone systems (Kentucky Geological Survey, University of Kentucky, 2001). Additional hazards include the emission of radon gas, collapsing of sink holes, and flooding of sink holes (Kentucky Geological Survey, University of Kentucky, 2001).

Despite the potential and real dangers of human development in these areas the extent to which this phenomenon is considered by public education science teachers in Kentucky is unclear. For example, no specific reference to this terrain is mentioned in the Kentucky Common Core Standards last updated in 2012.

### **Purpose of the Study**

Environmental education in grades K-12 is increasingly being investigated and there is growing evidence of the educational benefits linked to environmental instruction (Ernst, 2012). Research indicates that introducing children to these topics and ideas may enhance overall progress and growth towards a more sustainable world; however environmental education is often viewed as “something extra for which to find time” (Ernst, 2012, p. 75). So what are science teacher in these grades doing?

In the state of Kentucky, science education is not delivered as an independent class until the 4th grade, so the focus of this study was on 4th to 8th grade science educators. More specifically, the purpose of this study was to explore what content Kentucky public school science educators in grades 4 through 8 incorporate into their teaching in order to promote students’ long-term commitment to environmental sustainability and whether and how teachers in karst versus non-karst regions addressed concerns related to karst landscape. In addition, the study explored the factors these teachers believed either support or undermine students’ interest and involvement in sustainability efforts.

## **Research questions**

The following questions drove this inquiry: Do public school science teachers (grades 4-8) educate about the environment and/or environmental sustainability? If so, how do they attempt to promote students' long-term commitment to environmental sustainability? Further, how does geographical location inform teaching practices in this area? And, what factors do public school science teachers who educate about the environment believe will affect students' long-term commitment to promoting sustainability.

## **Definitions of terms**

*Environmental education* is the process by which individuals both children and adults- are informed about the natural world and its development, the relationship between the natural world and humanity, and how individuals can make informed and educated decisions as they interact with the natural world around them (naaee.net).

*Environmental sustainability* is defined as the relationship between the natural world and human activity and how the impacts of this relationship affect long-term continuation of coordination between humanity and nature (epa.org). According to the United States Environmental Protection Agency (2014), the essence of sustainability is the set of ideas and practices that seek to maintain and preserve conditions “under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations” (What is sustainability section, para. 1).

*Karst landscape* is defined by the Kentucky Geological Survey (University of Kentucky, 2001) as a unique terrain, developed over time, typically on limestone or dolomite, formed by the erosion and dissolving of rock, and is commonly characterized by sink holes, cave systems, and sinking streams.

### **Importance of the study**

It is important to explore current practices in Kentucky's science education classrooms in grades 4-8 in order to understand the extent to which long-term commitments to environmental sustainability may be fostered-particularly given that the children in these classrooms eventually become adults who live and work in the state. Kentucky based-social work education programs, for instance, need to know the extent to which their students' knowledge about the environment and their commitments to environmental sustainability has been fostered prior to entry into their programs. This is especially critical for future social work practitioners given the profession's emphasis on the importance of the interrelationship between person and the environment (NASW, 2008). In fact, the recent introduction to social work of "deep ecology"- the radical reconceptualization of the relationship between society and nature (Besthorn, 2012) has promoted some educators to search for better ways to foster students' environmental awareness and political involvement with relevant curricula (e.g., Van Wormer & Besthorn, 2010). As such, social work educators are increasingly focused on reframing and integrating environmental education into their material to encourage and foster practitioners to advocate for environmental justice and develop a more holistic,

environmentally-suited understanding of issues such as poverty (Schmitz, Matyok, Sloan, & James, 2012).

### **Overview of Thesis**

This project will discuss the current state of environmental education generally in K-12 education and higher education and specifically as it relates to Kentucky-based school systems and social work education.

## CHAPTER 2

### REVIEW OF THE LITERATURE

The environment or the natural world is a complex and vast system that is increasingly adapting and evolving as the patterns of human culture and society shift over time. The environment and humanity do not exist independently but within complex systems that depend on one another for maintaining a healthy quality of life (Koehn & Uitt, 2014). According to Engleman (2009), there is an obvious relationship between human choice and the natural surroundings of this earth and over time as population increases the relationship between humans and the natural world becomes increasingly stressed. To this end, Postma and Smeyers (2012) assert that “our sense of justice requires us to consider the implications and consequences of what we do now for the quality of future life” (p.400).

Gifford (2000) asserts that environmental problems are a result of human behavior and habit and must be addressed through a frame work of human behavior. The need for societies to adopt environmentally sustainable attitudes and behaviors is clear. However, the reality of effective maintenance and protection of the environment and biodiversity for future generations is a major challenge (Engleman, 2009). Despite a steady increase of literature and public awareness of environment conditions Blumstein and Saylan (2007) assert that “people have failed to make the link between their individual actions and the environmental condition.” (p.974)

## **Importance of environmental education**

As the world increasingly globalizes environmental issues and degradation are no longer isolated issues. While attention toward the consequences of poor ecological decisions and the emergence of clean, sustainable, and green ideas and products has heightened the question of efficacy remains. Despite increasing awareness and attention a more dramatic shift in behaviors may need to occur before significant change is felt. Fred Besthorn and Diane Tegtmeier (2012) call for assessment of current systems in this charge:

At the end of this millennium as systems, relationships, economics – even the weather – are heaving with dramatic change; many are now suggesting that we must shift to what is variously called a New Environmental Paradigm . . . which challenges the assumptions of our modern consumer culture. (p. 15)

The aim of environmental education particularly focused on sustainability is to enact this paradigm shift through the development of individuals who are well-educated about and appreciative of the physical and natural world around them. Further, environmental education “is the process that fosters greater understanding of society’s environmental problems and the processes of environmental problem-solving and decision-making,” (Saveland, 1976, p. 12, as cited in North, 2012).

Gifford (2014) states that “individuals with more education in general are more concerned about the environment” (p.545), and the literature on environmental education reveals that the ultimate aim of environmental education is to cultivate responsible environmental behaviors of individuals, and thus environmentally literate individuals (Disinger, 2001). As Bell (2004) has noted, the aim of environmental education ought to be to “create a new generation of citizens who are greener than their parents” (p. 43).

In 1970, the U.S. Congress passed the National Environmental Education Act, resulting in the creation of the Office of Environmental Education within the federal government. This act was the first of its kind developed by Congress to support the promotion of environmental education (National Environmental Education Act of 1970). This piece of legislation was further updated in 1990 and established further programs to increase public understanding and support of the environment (National Environmental Education Act of 1990). Despite this, there is still a need to influence culture beyond policy changes and political legislation through more focused education leading to the restructuring of perspectives and behaviors (North, 2012).

Concomitant with recent increases in environmental problems and issues, there has been a stronger push to expand programs supporting environmental education (Koehn & Uitto, 2014). Critically, such education can play a key role in promoting increased knowledge and awareness that result in a reshaping of perspectives in order to propel action to alleviate urgent environmental problems (Honeywood, et al., 2005). And, the

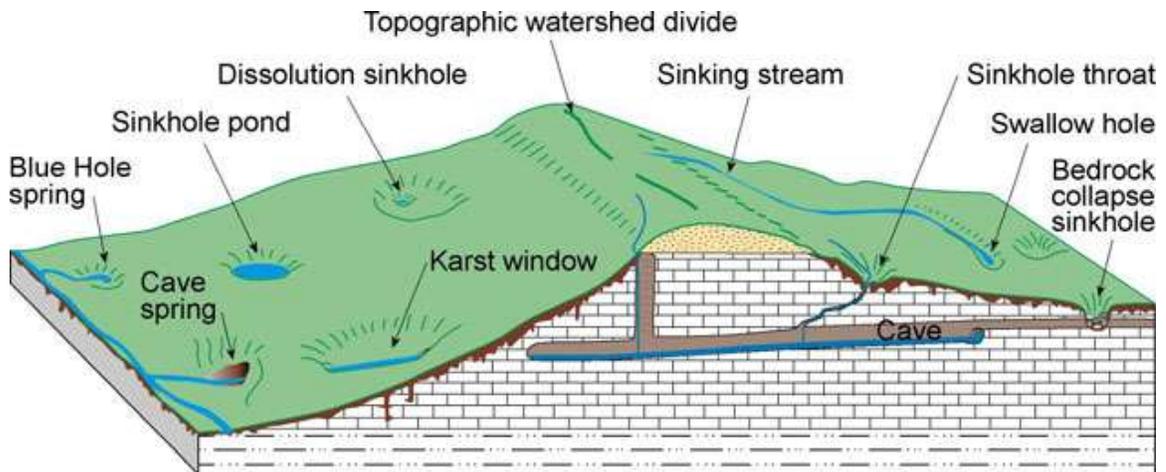
implications of developing effective environmental education can reach beyond the current generation and into the future (Postma & Smyeres, 2012).

Relevant to understanding the ways in which environmental education can shape behaviors, Malcolm, Hodgkinson, and Colley's (2003) differentiation of two types of learning has utility. Formal learning is that "individual acquisitional learning," (p.5) that takes place within an educational institution whereas informal learning is that which takes place through everyday experiences and within "non-educational settings" (p.5). While formal learning environments are dependent on predetermined content that delimits (and sometimes censors) learning that students will take away from the classroom, informal settings encourage involved, individualized learning that depends upon the individual and his or her interest. Relevant to environmental education, settings can include caves, parks, museums, movies, the Internet, and other forms of media. In these settings a participant can be provided with unique learning experiences. (Heimlich 2002, as cited in North, 2012). For example, these settings provide educational opportunities such as a "tour, workshop, exhibit, interactive display, interpretative video or other media, interaction with staff and volunteers, and/or brochure, amongst many others" (North, 2012, p.40). Blanchet-Cohen and Reilly (2012) have argued that learning is greater when teachers and learners engage in a dynamic process where curriculum is co-authored, meaning that the learning process is a collaborative effort between educator and student. For this reason, environmental education that is also context specific has the potential to be effective in influencing students' attitudes and behaviors (North, 2012). The next section focuses on a

context (i.e. geographically) specific environmental phenomenon that presents a potentially important area for environmental education to focus on.

### **Karst Landscape**

Karst is formed on carbonate rock, typically limestone and dolomite. Karst features develop as the limestone bedrock is dissolved by percolating acidic groundwater to form caves and sinkholes (Kentucky Geological Survey, University of Kentucky, 2001) (see Figure 1). The development of karst landscape is a slow process over thousands of years and eventually creates caves and sinkholes because of the erosion (Ritter, 2009).



*Figure 1. Karst Landscape Features*

According to Ford and Williams (2007), these terrains cover approximately 12 percent of the world's land surface, provide livable environments for over 25 percent of the world's population, and supply 20-25 percent of the world's populace with drinking water (as cited in North, 2011). Karst landscape is a prevalent natural phenomenon shaping the

landscape of the state of Kentucky. As displayed in Figure 1 when rain falls and penetrates into the ground the water seeps into the soil and is filtered through the fractured landscape. And, according to the Kentucky Geological Survey, nearly 25 percent of the land area in the state of Kentucky has well-developed karst features (see Figure 2). The University of Kentucky states that

“about 55 percent of Kentucky is underlain by rocks that could develop karst terrain, given enough time and about 38 percent of the state has at least some karst development recognizable on topographic maps”

(Where is Karst Located in Kentucky, para. 2, 2013)

Recently, Kentucky made the news with the collapse of a sinkhole at the National Corvette Museum on February 12, 2014 resulting in damage to eight vehicles (CNN, 2014). Patrons were not in the museum at the time but if they would have been there would likely have been injuries or even fatalities.

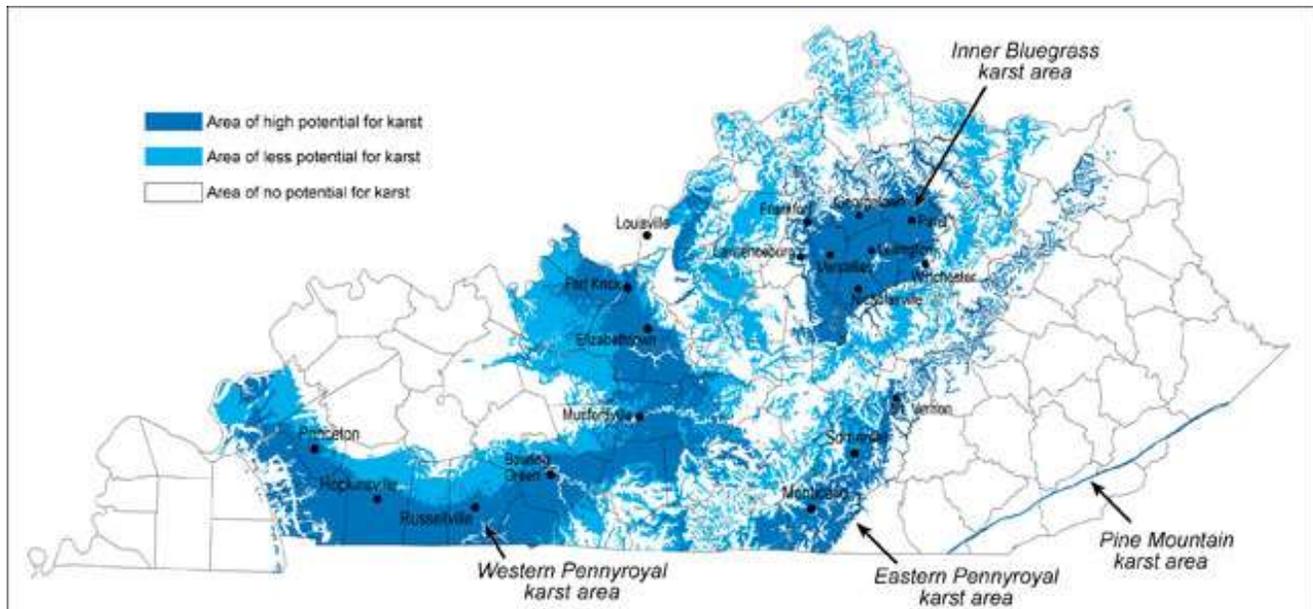


Figure 1. Karst Landscape

In karst regions water flows through the cave systems potentially collecting raw sewage from residential areas, industrial run-off (either inadvertent – or by design), farming pollutants, and any toxins or chemicals in the soil or cave system (Kentucky Geological Survey, 2011) As a result of limited regulatory protection, insufficient resources and/or an inaccurate understanding of karst landscapes communities do not understand how to maintain karst areas (Fleury, 2009). Groundwater is often contaminated by household waste and ill-suited septic systems for instance. Waste in the typical septic system, for example, slowly filtrates through the soil. But because ground water in karst areas moves through an area so quickly, the waste is not properly filtrated through the septic system- thus affecting the quality of ground water. As the groundwater is affected this has the

potential for public health concerns as humans consume this water directly or indirectly through the consumption of agricultural goods (Kentucky Geological Survey, 2011).

Additional hazards of karst regions include collapsing ground, flooding, and the accumulation of radon gas. The ground becomes weak in karst regions as a result of the formation of sink holes or a cavity formed in the ground as a result of the eroded limestone. Over time as the land is developed it becomes at risk for falling in. Further complicating the phenomenon, as sinkholes develop they are susceptible to flooding during intense rainfall over a short period of time (Kentucky Geological Survey, 2011). In many karst regions residential areas have been developed atop these surfaces and flooding has created serious issues for individuals and families. For instance in Warren County in south central Kentucky individuals are faced with karst related issues when sink holes collapse and destroy property such as the incident at the National Corvette Museum (CNN, 2014). Additional problems residents face are the flooding of sink hole areas and the dumping of garbage and trash further polluting the ground and water of surrounding areas.

The accumulation of radon gas is a further challenge created by karst landscape and results in dangerous, even deadly levels that seep into homes typically via cellars and basement areas. According to the Kentucky Cabinet for Health and Family Services (2013), soil contamination is one of the largest vehicles for radon gas entering a home. Radon rises into the home through cracks and fissures in the limestone bedrock and further through crack and breaks in the homes foundation. Exposure to radon gas is

damaging to human health and can cause damage to lung tissue that can lead to the development of cancer.

### **(The Absence of) Karst Education**

According to North (2012), “despite the abundance of karst terrains and the important role they play in a wide variety of roles including supplying freshwater drinking supplies,” (p.1) there is little education and accessible resources promoting the understanding and protection of these landscapes. In the state of Kentucky, for example, its Next Generation Science Standards are divided into various sections outlining academic expectations and programs of study at each grade level. According to its Science Standards, students in grades 4-8 are expected “to understand scientific ways of thinking and working and use those methods to solve real-life problems” (State of Kentucky, p.1) as well as “identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events” (State of Kentucky, p.1). However, no explicit content on karst landscape is included. This is especially problematic given that the Standards guide Kentucky science educators’ decisions about the type of environmental education-they provide to students. Absent any directives related to curricula on karst landscape it cannot be assumed that Kentucky’s public school science educators include such content in the environmental education they deliver.

Moreover, as Erickson and Schultz (1992) have argued “environmental education is laden with normative ideas, shaped by teachers’ values,” (as cited in Blanchet-Cohen

& Reilly 2012). They assert that, “student learning and understanding are dependent upon both the manifest [i.e. the educational content] as well as the hidden curriculum [i.e. the implicit reactions and ideas presented by their teachers about the topic]” (p. 1).

For these reasons, it is imperative to explore what Kentucky-based public school teachers are currently doing in the classroom with regard to environmental education. Moreover, it is critical to understand how they address sustainability and to what extent they highlight karst landscapes in their curriculum. Findings from the study are important for educators in post-secondary education because it will help inform administrations and decision-making bodies as they further develop environmental curricula.

### **Summary**

Chapter two discussed the rationale of this study as it was derived from relevant literature. The next chapter describes the methodology used to investigate the research questions derived from the review of the literature.

## CHAPTER 3

### METHODOLOGY

The primary focus of this research project was to investigate Kentucky-based public school science educators' (grades 4-8) efforts to integrate information related to environmental sustainability and karst landscape into their teaching. In addition, the study explored teachers' perspectives regarding factors that may facilitate or hinder these efforts.

#### **Description of Research Methodology**

##### **Research Design**

This qualitative study was exploratory in nature and aimed at further understanding the current context of environmental education in the state of Kentucky as it pertains to karst education. Prior to this study, no studies focused on environmental sustainability education in the science classroom had also explored the integration of karst content into teaching. Data was compiled through semi-structured interviews and analysis focused on deriving the meaning of identifying patterns across, and drawing relationships between, teachers' reports of their educational practices, and their perspectives regarding community and family norms, and their students' behavior related to environmental sustainability.

## **Operational Definition of Variables**

*Definitions of environmental sustainability.* A teacher's definitions of and explanation of concepts related to environmental sustainability.

*Environmental sustainability content.* The type of content related to environmental sustainability such as pollution, water quality, air quality, environmental degradation, over consumption, etc that a teacher reports integrating into his or her teaching.

*Karst landscape content.* The type of content related to karst landscapes (e.g., water quality/pollution and radon gas, sinkholes, and cave systems) that a teacher reports integrating into his or her teaching.

*Effort to support student commitment to environmental sustainability.* The extent and nature of a teacher's effort to encourage students' long-term commitment to promoting environmental sustainability. This included a teacher's efforts to collaborate with the community to address sustainability issues at his or her school and in the community.

*Factors affecting student commitment to environmental sustainability.* A teacher's idea about those school-based, individual, family, and community factors that may support students' long-term commitment to environmental sustainability.

## **Sample**

### **Selection of Subjects**

Potential participants in this study were public school science educators (grades 4-8) in the state of Kentucky from karst and non-karst regions. In order to explore possible geographical and regional differences purposive sampling using a snowball technique

was utilized to select participants. (Because the exact proportion of teachers in Karst areas versus non-Karst areas was not investigated a quota technique was not utilized when acquiring the sample.) Initial contact was made with an educator known to this researcher who then referred the researcher to other colleagues as possible participants. Potential interviewees were contacted initially via email inviting them to participate in the study and providing them with a basic overview of the nature of their participation and of their expected contributions to the research. For those teachers who agreed to participate in the study, follow up contact occurred via telephone to confirm the teacher's participation prior to the interview. Overall, this strategy was effective in identifying and interviewing a geographically representative sample given that individuals from various regions of the state-both karst and non-karst- were included. However, it should be noted that this sampling strategy was inherently limited (12 subjects) in that the perspectives of other teachers in Kentucky were not included in the study thus limiting the transferability of the study's findings. (This was primarily an outcome of the resources available to the researcher).

### **Interview Guide**

The interview guide utilized during this study was designed by this researcher and included sixteen questions derived from three central research questions 1) do public school science educators (grades 4-8) teach about environmental sustainability 2) what factors do these educators identify as impacting students' commitment to promoting sustainability and 3) how does the geographical location inform teaching practices in this

area? The interview guide consisted of three demographic questions, one question about the teacher's institution, and twelve questions relevant to the aforementioned research questions. Demographic questions assessed the teacher's gender, number of years teaching, and number of years they had taught science. In addition, the teachers were asked to provide the percentage of free and reduced lunches offered by his or her school as a proxy for the income level of the school's students. The guide also included twelve questions pertaining to the environment, sustainability, and individual teaching methods related to incorporating environmental sustainability and karst concepts (see Appendix D). The general focus of these questions was to uncover the teacher's perspective on environmental education and determine the extent to which they covered material on karst terrains in their teaching. The majority of the questions were open ended, thus allowing the teachers to expound upon their answers and provide relevant insight. In addition, this form of questioning allowed the researcher to ask probing questions and pursue areas of interest and areas that needed to be clarified. The first seven questions attended to the educator's definition of environmental sustainability and specific teaching practices and behaviors they brought into their classroom to teach about the environment and related issues. Four questions sought to understand the teacher's perspectives on factors impacting students' long-term commitment to promoting environmental sustainability outside of the classroom. And, a final question offered the teacher the opportunity to suggest or recommend avenues that may positively support environmentally sustainable practices.

### **Protection of Human Subjects Approval Process**

This study was approved by Western Kentucky University's (WKU) Institutional Review Board (IRB). The application process required detailed information and documentation pertaining to the research project, and approval from the IRB ensured the integrity of the research and confirmed that the study would not endanger or present harm to study participants. All IRB regulations were adhered to through the completion of the study. Confidentiality was maintained and protected throughout the process as names and identifying information were omitted from written documents. Further, all data were stored on a password secured laptop (see Appendix A).

### **Procedure**

Potential participants were contacted via email in November of 2013. As responses were received interview times and dates were determined. The first interview was conducted in November of 2013 and the final interview in January of 2014. Eighteen total individuals were contacted with a request to participate with twelve deciding to participate. Two indicated that they were willing but did not respond with a possible time to interview, and four did not reply to the email. The interviews were conducted face-to-face by this researcher and took place within the educator's classroom outside of instructional hours and with no students present. It is argued that interviewing teachers in their classrooms provided deeper insight than a survey or questionnaire would have

allowed for because it provided face to face interaction in a comfortable setting and allowed them time to elaborate and provide thoughtful feedback.

### **Data Collection**

The data for this study was collected through digital audio recordings of each interview as well as typed and handwritten notes that were composed with participant permission throughout the duration of the interview. The digital audio recordings were uploaded to a password secured laptop and erased from the device.

### **Data Analysis**

Following transcription of the twelve interviews into separate Microsoft Word documents, this researcher and faculty advisor created a Microsoft Excel spreadsheet to begin to organize the teachers' responses to the interview questions. The data analysis began with the organization of elements from the twelve interview transcripts into sixteen categories based upon the teachers' responses to the specific interview questions. These elements (i.e., teachers' direct quotes) were then analyzed to identify the themes explicit and implicit in the teachers' commentary. The researcher and faculty advisor compared the themes each identified to refine these themes and begin to identify patterns in the teachers' observations. The data were then further refined to ensure that resultant patterns were exhaustive and consistent with the data. This analysis then provided the basis for the conclusion and insights presented in the final chapter of this report.

### **Summary**

This chapter provided an overview of the research methodology used for this study, a description of the study's research design, the operational definitions of the variables investigated, an overview of the sample and the process of selecting subjects, a description of the instrument, a brief summary of how human subjects were protected, a description of the data collection methods, and an overview of the data analyses. In Chapter 4, the results of the study are described.

## CHAPTER 4

### RESULTS

The purpose of this study was exploratory and focused on examining environmental education within public school science classrooms in grades 4-8. This study sought to explore the attitudes and practices of teachers across the state as related to environmental education and environmental sustainability. Additionally, educators were selected from specific geographic regions (karst and non-karst) in order to better understand geographical influence on environmental education.

#### **Description of the Sample**

The sample included nine females and three males. Three interviewees were 4th grade teachers, two were 5th grade teachers, two were 6th grade teachers, one was a 7th grade teacher, and four were 8th grade teachers. Eleven of these teachers were tenured and one was a non-tenured teacher. Seven teachers interviewed taught in schools located in karst regions and five taught in non-karst areas. In total, four Kentucky counties (Madison, Bell, Warren, and Logan) were represented in the sample. The participants had been teaching for an average of 15.8 years and teaching science for an average of 12.6 years.

## **Analysis of Interview Data**

As noted in the previous chapter, content analysis was used to analyze the transcripts of the interviews to identify underlying patterns and themes in the teachers' commentary relevant to the research questions. These themes included teachers' commentary-or absence of commentary- on: 1) Environmental sustainability as a lifestyle choice; 2) Education about environmental sustainability; 3) The nexus of family, school, and community; and 4) The importance of geographical context.

**Environmental sustainability as a lifestyle choice.** To establish a baseline perspective of these educators, interviewees were asked how they defined environmental sustainability. The majority of definitions provided by these teachers were human centered and focused on the idea of personal responsibility (i.e., what we, as individuals, can do for the environment). Some definitions tended to be both generic and broad thus reducing environmental sustainability to lifestyle decisions only. For instance, one interviewee described the concept as “Doing what we can to preserve the environment through lifestyle choices,” [#3] indicating that sustainability of the environment is an individual action based upon individual choices. Similarly, another teacher stated that environmental sustainability involved “preserving resources through your living,” [#5] reinforcing the idea that sustainability is achieved via lifestyle choices. One teacher noted that environmental sustainability to her meant “not to over use our resources and to reduce, recycle, and reuse” [#4]. In effect, this teacher was describing environmental

sustainability as specific behavior. Similarly, another teacher stated that environmental sustainability is “protecting the environment [#2] as was also noted by several educators. For example, a teacher stated that environmental sustainability is “any way that we use natural resources in a renewable fashion” [#6].

**Education about environmental sustainability.** Five of the twelve teachers interviewed indicated that “environmental sustainability” is not part of their curriculum. As one educator indicated: “it is not discussed in our curriculum, it is not part of the content,” adding that “it is really just integrated in other topics that are somewhat related, but not explicitly” [#9]. Those who did introduce this concept into their teaching indicated that they primarily focused on teaching about personal responsibility. One educator from a non-karst region reported that when she introduced her students to environmental content she taught them “personal responsibility in a desired environment” “and that the motto she teaches her students is: “if they take something they need to give it back” [#1]. During the interviews educators were asked to discuss factors they believed can support students’ life-long commitment to environmental sustainability. Several identified modeling as important to integrating environmental content. Expressing her understanding that, developmentally, children are often at a stage that is conducive for shaping behaviors, one teacher observed, “Kids are young so modeling is always a great strategy” [#11]. She further described the way that she models to her students through being a good steward of energy by “turning off the lights and computers” in her

classroom and through personal testimonies describing her own experiences [#11]. She stated, “The best thing I can do is give them the information at school and hope that it has a great impact on their thinking and doing in the future” [#11].

However, modeling aside, and specific to content on karst landscape, when the participants were asked how they attempted to educate their students about this phenomenon, these teachers overwhelmingly reported that karst education was absent from the classroom. As one teacher noted, “We do not discuss karst landscape in our curriculum” [#11]. This sentiment was shared by each educator interviewed as none expressed an integration of karst topography.

**The nexus of family, school, and community.** One focus of this research study was to uncover the insights and perspectives of educators regarding what factors they believed impact students’ long term commitment to sustainability. While these teachers indicated limited integration of content on environmental sustainability in their teaching, their responses as to why students may not be committed to environmental issues and sustainability were fairly consistent. The responses revolved around the common theme that exposure to knowledge about these issues through both formal and informal means was needed. These included not only the school but also the family and community. Relative to the importance of family, one educator observed, “[students] haven’t bought into it,” [and] “their families do not demonstrate this awareness about environmental issues to them so it’s not really a thought for most of them,” [#3]. Another educator noted

that in regard to developing sustainable lifestyles and behaviors a major factor that may hinder students is the socialization and information they receive at home. She asserted

Their parents aren't educated. Ignorance at home is a big thing, the children model what their parents do. You can tell the difference between the children whose parents do talk to them about these issues. The main problem is that they don't see much of a drive or emphasis outside of school at all. [#1]

Ideas about the importance of a more holistic view of environmental sustainability that better links local schools to students' communities were expressed by several educators. For example, one teacher when discussing factors that would support students' commitment to long-term sustainability stated that "more opportunities within the community for students and teachers (emphasizing these issues) would help greatly" [#10]. Another teacher noted the need to work "with the community more to talk about the importance of sustainability," noting that "education is key" [#6]

### **The importance of geographical context.**

Meichtry and Harrell (2002) have found that Kentucky-based teachers indicated that the highest levels of need in the classroom are funding and acquiring lesson and curriculum ideas. This idea was discussed by several teachers including a 7th grade educator who described a need for "environmental science endorsements" [#7] or another 15 year

veteran who stated that there is a growing need for “state-wide concern and funding for development for content at district levels” [#10].

The geographical selection of participants in this study was purposeful in order to highlight potential differences between teachers in different regions of Kentucky. Surprisingly, regardless of region, none of the teachers independently discussed information about karst terrain without prompting. However, if the topic turned to an environmental issue that was geographically specific and relevant to a teacher, s/he expressed greater knowledge and enthusiasm for the subject. For instance, a teacher in eastern Kentucky where mountain top removal or logging occurs was more likely to discuss these issues than those not in these areas. Conversely, there was little discussion on subjects such as karst terrains or cave systems by those teachers in non-karst regions. Several educators in the western region of the state, while not indicating that they explicitly included language or content pertaining to karst landscape in their teaching, cited the value and relevance of field trips to local caves. As noted previously, when asked about the definition of “environmental sustainability” many of the teachers had a difficult time articulating a coherent response making comments like, “Oh, this is difficult,” [#2] or “Wow! Starting with a hard one” [#1]. However, when questions were rephrased through the use of a geographically relevant example, the teachers were more readily able to respond.

## **Limitations**

As a qualitative and exploratory study there were several limitations inherent to the design and methodology utilized. One significant limitation of this study was the lack of representativeness of the sample. To improve this for future study it would be necessary to first compile data regarding the number of science educators in karst areas versus non karst areas in order to provide the basis for sampling with a greater opportunity for generalizing findings to teachers in these areas. The method of acquiring participants via email also limited the amount of interviews conducted because email is less personal and more readily overlooked. To further support the findings a larger sample of educators is needed. Additionally, it would be beneficial to explore the topics highlighted in this study with educators who have an expressed passion for and commitment to actively integrating the environment, environmental sustainability, and karst landscape issues into their teaching.

The overall construction of the interview guide appeared to be relevant to the teachers in this study; however, some of the questions such as “Do you cover radon gas?” may have been unclear to participants, possibly resulting in a limitation in the range of responses the teachers provided. These questions assumed that the interviewee understood the relationship between the accumulation of radon gas and karst landscape and therefore did not initially make sense out of this question.

The majority of teachers interviewed for this study was tenured and had been teaching several years. The inclusion of a younger professional population would also be beneficial. Lastly, exploring the perspectives of science teachers from higher grade levels (9-12) would potentially provide greater insight regarding the process and impact of environmental education from elementary to middle and high schools.

### **Summary**

The chapter began with a description of the sample including a demographic profile of the respondents. This was followed by an analysis of respondents' comments. Finally, a discussion of the limitations of the study was provided. Chapter 5 provides a discussion of these results, and identifies conclusions that emerge from these findings including implications and recommendations for social work education programs and for future research.

## CHAPTER 5

### DISCUSSION

A review of relevant literature and a rationale for the exploration of environmental education among Kentucky public school educators in grades 4-8 has been provided. Additionally, this study has presented results from twelve interviews with Kentucky-based public education science teachers. This chapter presents an analysis of these results and the implications of these findings for both social work education and future research.

#### **An Individualistic Versus Holistic View of the Environment**

The need for shifting lifestyle choices and increased personal responsibility relative to the natural environment is important when envisioning a more sustainable and harmonized world. However, the driving attitudes and beliefs rooted in capitalistic notions of personal responsibility and ideologies supporting this view are often incomplete and may undermine the purpose and true intention of sustainability (Patterson, 2010). The majority of educators in this study espoused a person or human centered understanding and conceptualization of environmental sustainability that focused on the idea of personal responsibility (i.e., what we, as individuals, can do for the environment). Environmental sustainability for these teachers was essentially reducible to the notion that humanity can simply give back or protect the environment. While not

inherently wrong, their views were incomplete and failed to recognize what Besthorn (2012) characterizes as equality between all living beings and the interconnectedness and dependence between humanity and the natural world. From a holistic perspective, their definitions omitted a more encompassing definition that describes a radical reorientation to the environment and humanity's relationship to it. Instead, their perspectives position humanity as superior to the natural world creating, as Besthorn (2012) has asserted, a distinct separation between humans and non-humans. Consequently, this perspective limits progress towards sustainable life-styles.

When asked to describe their efforts to integrate content on environmental sustainability into their teaching, these teachers reported limited to no infusion. The reasons for this omission were unclear. However, these educators' individualistic orientation to or values about environmental sustainability may explain the limited extent to which this content was reported to be infused. But, while these educators largely omitted any explicit integration of content on environmental sustainability into their teaching, it important to note that when asked to explore how students' long-term commitment to sustainability issues could be fostered, they expressed, the importance of the connection between, family, and community.

## **Fostering the Connections Between School, Family, and Community**

The analysis of these interviews highlighted the possibility that encouraging students' environmental responsibility in formal settings may not or should not be the sole setting in which this occurs.

Systems theory emphasizes a reciprocal relationship between individuals and the environment. As such, individual elements are a part the whole influencing and being influenced by external systems. Individual family members, for instance, do not exist and cannot be fully understood in isolation of their family and are, in fact, shaped and impacted by their family. The parent-child relationship is fundamental to shaping the attitudes and behaviors that would support long-term commitment and motivation to engage in sustainable living (Brook, Lee, Finch, & Brown, 2012). According to Pavarini, Hollanda, and Hawk (2013) “through their interactions with parents, children acquire knowledge, abilities, and resources that are crucial for their adaptation and wellbeing” (p. 845). Consistent with this observation, several educators highlighted that promoting long-term sustainability practices and behaviors among students must consider the role of various social structures and systems – specifically the family, school, and the larger community. More broadly, therefore, it is important to identify and understand the different systems influencing children and the development of their life-long behaviors including the community.

Strong communities dedicated to supporting and promoting the sufficiency of each member are more likely to attend to the various needs of individuals and how they have been shaped by their experiences and environment in which they live. As Blanchet-Cohen and Reilly (2012) have asserted, “a stronger sense of whole, in terms of social cohesion” (p. 14) promotes healthy growth and communal development. Communities in which community and individuals health and well-being are bound together strive towards the vision of a society at peace and harmony with itself and the world (Blanchet-Choen & Reilly, 2012). These educators articulated a direct correlation between the development of environmentally conscious and responsible children and their schools, their parents, and opportunities available to them in the community. The inclusion and cooperation of family and community institutions in the construction of educational content and educational programs can provide a unique context and foundation for linking families, schools, and communities.

### **The Importance of Context**

When ideologically-controversial-environmental subjects such as pollution and air quality were discussed during the interviews the responses of educators were often limited and generic. In contrast, when local environmental topics were discussed teachers’ interest was piqued. It may be that curriculum focused on the environment could be more penetrating when it is delivered through the lens of a local perspective and touches on local environmental concerns. If teachers are afforded and encouraged to

deliver context specific education (possibly outside of common standards) then it could potentially benefit environmental education. However, a lack of emphasis on environmental sustainability in education at the state level will likely result in limited content in this area. According to the Kentucky Department of Education (2014), as of June 5<sup>th</sup>, 2013 the Next Generation Science Standards were approved to be Kentucky Core Academic Standards for Science. Though approved on the state level actual decisions regarding curriculum development and teaching are made on local district levels. However, despite this emphasis on localized education, geographically-specific, localized environmental issues were not discussed to any great extent in the teacher's reports of their teaching. Nevertheless, because the Next Generation Science Standards allow for more local control, this may better facilitate the integration of karst and other local environmental issues into the science classroom.

### **Implications for Social Work Education**

Although educational programs for children are crucial and can play an important role building the habits and commitment required of individuals for a life-time of effort to promote sustainable practices, this endeavor in-and-of-itself will not likely result in a dramatic improvement of environmental conditions. Therefore, the benefits of these educational pursuits will only be valuable for reframing human interaction with the environment if these gains are scaffolded upon as these children transition into adulthood. Systems of higher education provide a unique opportunity to do this to build upon the

motivation and momentum begun in childhood. Thus, the rationale for intentionally integrating this content into higher education systems is highlighted. Given its focus on human well-being, one discipline where this is a critical enterprise is the profession of social work.

Since the early 2000s, environmental activism and consciousness has emerged among social work practitioners. For instance, in 2000, the US National Association of Social Workers' (NASW) Board of Directors verbalized intentions to move towards a more environmentally accountable and sensitive method of practice (NASW, 2000, as cited in Besthorn, 2012, p.248). This is critical in that research, for instance, has highlighted a definitive link between the twin social problems of poverty and violence and environmental sustainability (Schmitz, Matyok, Sloan, & James, 2012).

Environmental racism, the placement of low income, minority groups who are often the clients of social workers within or near a proximity to environmentally dangerous areas is a social phenomenon social workers may address through their practice. Social work practitioners are well positioned to address this and other similar issues.

Social work professionals are trained with specific skills to promote change in micro, mezzo, and macro systems, and as a unique “field not only of direct practitioners but also of leaders, change agents, activist, and community builders” (Schmitz, et al., 2012, p.281), the profession can play an instrumental role linking their efforts to promote social justice to the promotion of environmentally sustainable outcomes. According to

Schmitz, et al. (2012), social workers “have the core skills necessary for environmental practice as they excel in networking, linking, and engaging multiple sectors of marginalized communities, all of which are important to sustainable development” (p.278). Therefore, emphasizing their role as an active agent of change in the community throughout their education, students’ motivation to engage in multidimensional scopes of practice may be increased.

Scholars have exhorted educators to take a more assertive role in fostering students’ attention towards environmental issues by incorporating deep ecology ideas as a framework for informing practice and developing a more complete understanding of the person-in-environment that includes the natural world (Schmitz et al. 2012). To this end, environmental topics are slowly integrating into the classrooms through reading materials and class projects (Adams, 2013). For instance, the inclusion of these topics is requiring practitioners, educators, and students to reflect on their values and understanding of the relationship between humanity and the natural world. Deep ecology, a term introduced by Arne Naess, describes the idea that nature and humanity do not exist independently and emphasizes the worth and value of all living beings. This ideology promotes a radical reconstruction of modern society, culture, and the environment (Besthorn, 2012). This reflection of these topics within the social work classroom may allow for the reorientation of the perspectives of practitioners and educators, serving as a catalysis to promote what the Global Alliance for Deep-Ecological Social Work (2011) identifies as a “deep interconnected and interdependent between the ecological, political, social, and

spiritual aspects of the natural world” (Its Environmental, Spiritual and Political Dimensions, para. 1) These realities and the restructuring of perspectives may inform and guide social worker’s ecological concerns and professional practice (Global Alliance for Deep-Ecological Social Work, 2011).

Adult learners typically want to know the application of what they are learning to what they want to achieve (Walter, 2013). Therefore, providing a context of practice for students will be vital to the successful implementations of ecology and environmental studies in Social Work education. It is imperative that social work educators understand ideological and personal resistance that may be uncovered when facilitating discussion about this content in the classroom and work to assist and encourage students to draw from their experiences to reflect upon, critically analyze, and examine their personal biases or habits that inform their world view (Lysack, 2012). This is likely to include the extent of their exposure-if any-to environmental education.

Relevant to this context, Honeywood et al., (2005) note that, in the instance of higher education there is a disconnect between the presentation of factual information in formal learning structures and the ability for students to connect this information to relevant practical applications. The authors have argued that student centered formal structures or those that are positioned around the interest of the students within the classroom is a means more likely to result in effective environmental sustainability education because it is individualized and more likely to achieve perceived and actual

relevance. Inside the classroom this would look like content relevant to the environment of the students and their interests.

While this may be the case, a challenge facing efforts to include environmental sustainability content in social work education is the limited scope and narrow focus of the established curriculum. And, as Ralph and Stubbs (2013) have noted, incorporating environmental issues and sustainable ideas into higher education through the restructuring of curriculum can prove to be a challenging process for educators and administrators. Moreover, Honeywood et al. (2005) have identified limited cross-discipline interaction, preparation, and curriculum gaps as a major hindrance to the infusion of environmental and sustainability education in higher education. Therefore, there is a need to attend to a more inclusive model of education that borrows skills and knowledge from various disciplines and areas of study in order to develop a more well-rounded and competent learner. Schimtz et al. (2012) assert that “when the social, political, and economic objectives coincide, they create the greatest potential for positive sustainability” meaning sustainability that is progressive and effective and can be achieved by higher education (p.280).

But, further that this, there is a need to educate social workers in such a way that, as community educators and developers, they will bring and appreciation and understanding of how the physical environment cannot be separated from the experiences and well-being of those they serve in their respective settings. To do this, social work

educators should strive to include explicit environmental education encompassing the interrelatedness of persons and the natural environment.

Schmitz et al. (2012) have argued that the social work curriculum should better encompass the physical sciences and provides informal opportunities for students to engage the environment from a more student centered or individualized context to promote meaning and relevance. Additionally, there is a need to identify context specific models of education that seeks to educate future practitioners on environmental issues that will directly impact their client systems and communities. For example, in the state of Kentucky social work education should seek to incorporate content on karst landscape and the implications presented by this terrain in order to ensure that social work practitioners are better able to work as change agents in these communities impacted by this environmental phenomenon. Therefore, social work educators must develop a holistic teaching methods and approach that presents environmental education in localized, community specific contexts so that students will embrace a practice better suited to promoting context-specific environmental sustainability and its connection to the well-being of their client populations.

### **Future Research**

This study serves as a foundation for further research in this area. For instance, what are educators across the state that are explicitly introducing their students to environmental education and sustainability content doing? An alternative line of inquiry

could be a more thorough investigation of the ways in which science educators' conceptualize the link between societal norms, education, and the environment. K-12 and higher education administration, curriculum advisors, and educators would benefit from expanded research on this topic to help inform policy and the development and implementation of more effective curriculum. To expand this study further exploration of what research concludes about the efficacy of elementary school teachers and teaching science and further identifying what methods and specific pedagogy science teachers use within their classrooms. Further research would able social work educators to better equip their students for their future career and practice.

The inclusion of a younger professional population would also be beneficial. Lastly, exploring the perspectives of science teachers from higher grade levels (9-12) would potentially provide greater insight regarding the process and impact of environmental education from elementary to middle and high schools.

### **Concluding Remarks**

Generally, this project was focused on exploring the efforts of Kentucky-based public school science teachers in grades 4-8 on the inclusion of education on environmental sustainability in their teaching. However, to be better stewards of the environment, we need to focus on science education from kindergarten through higher education in order to ensure that the citizenry recognizes the critical need to live in

harmony with nature otherwise the situation for humans and the natural world will continue to be grim and threaten the quality of which life exists.

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## APPENDIX A

### INFORMED CONSENT

Western Kentucky University

#### GENERAL CONSENT TO PARTICIPATE IN RESEARCH

Science Education and Sustainability

Amanda Gallion

Department of Social Work (270-659-6914)

You are being asked to participate in a study conducted by Amanda Gallion through Western Kentucky University and supervised by Simon Funge, Ph.D., MSW, and an assistant professor of Social Work at the same university. You were selected as a possible participant in this study because you are a science educator for students between grades

4-8 at a public school. The University requires that you give your signed agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask her any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have.

If you then decide to participate in the project, please sign on the last page of this form in the presence of the person who explained the project to you. You should be given a copy of this form to keep.

#### PURPOSE OF THE STUDY

The purpose of this study is to understand how public school teachers (grades 4-8) educate about environmental sustainability and how this education impacts students' long-term commitment to promoting sustainability.

#### PROCEDURES

If you volunteer to participate in this study, you will be asked you to:

- Participate in one face-to-face interview lasting approximately 30-45 minutes.

You will be asked questions about your teaching practices as it relates to the environment and sustainability. This interview will be recorded.

#### POTENTIAL RISKS AND DISCOMFORTS

There are no anticipated risks or discomforts associated with participation in this interview. The questions that are to be asked are related to your teaching practices and integration of specific topics into your teaching. However, if you feel uncomfortable for any reason during the interview, you may end your participation at any time and/or request that the note-taking and/or audio-recording be stopped.

#### POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

You will not directly benefit from your participation in the research, but your participation may help you gain a better understanding of your teaching strategies and inclusion of environmental components. It is anticipated that findings from this study will contribute to the scientific knowledge concerning how science educators across the state address sustainability and the environment in their classrooms.

#### PAYMENT FOR PARTICIPATION

You will not receive any payment for your participation.

#### CONFIDENTIALITY

The interview will be audio-taped and hand notes may be taken. You have the right, at any time, to request that the note-taking or audio-recording be stopped. You have the right to review the notes and recording made as part of the study to determine whether it should be edited or erased in whole or in part. Our name will not be attached to any notes or recorded files. In addition, any identifying information you provide during the course of the interview will be redacted from the transcript of this interview. The notes and audio recordings will be reviewed only by Amanda Gallion and Simon Funge, Ph.D. and after the study is completed they will be destroyed.

#### PARTICIPATION AND WITHDRAWAL

You can choose whether to participate in this study or not. If you volunteer to participate in this study, you may withdraw at any time without consequences of any kind.

#### IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact Amanda Gallion at 859-625-2249 or [Amanda.gallion245@topper.wku.edu](mailto:Amanda.gallion245@topper.wku.edu) or Simon Funge at 270-659-6914 or [simon.funge@wku.edu](mailto:simon.funge@wku.edu).

#### RIGHTS OF RESEARCH SUBJECTS

Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

**SIGNATURE OF RESEARCH SUBJECT**

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form. You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

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Name of Subject

---

Signature of Subject

---

Date

**SIGNATURE OF INVESTIGATOR**

In my judgment the subject is voluntarily and knowingly giving informed assent to participate in this research study.

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Name of Investigator

---

---

Signature of Investigator

Date

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY

THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD

Paul Mooney, Human Protections Administrator

TELEPHONE: (270) 745-2129

APPENDIX B

## EMAIL SCRIPTS

This email was the initial point of contact with potential participants

SUBJECT: Request to Participate in a Study on Teaching Environmental Sustainability

Mr. / Ms. [educator's name]

My name is Amanda Gallion, and I am Bachelor of Social Work student at Western Kentucky University (WKU) and the Principal Investigator of a research study related to teaching practices and environmental sustainability. This study is being conducted under the sponsorship of Simon Funge, PhD, an Assistant Professor from WKU's Department of Social Work.

I am contacting you because you are a public school science educator of students in 4th, 5th, 6th, 7th or 8th grade. I was referred to you by \_\_\_\_\_ at \_\_\_\_\_ School \_\_\_\_\_ in \_\_\_\_\_ County. Should you be interested in participating in this study, I would like to invite you to participate in a thirty to forty-five minute interview at a time and location convenient to you. My preference is to conduct a face-to-face interview at a location convenient to you; however, I am also able to conduct the interview over the phone. During the interview I will ask you a series of questions pertaining to your teaching practices specifically with regard to the environment and sustainability. It is important to note that the interview will be audio-recorded.

At the start of the interview, an Informed Consent form will be reviewed with you, and if you continue to be willing to participate in the study, you will be asked to indicate your consent to participate in the study by signing the form.

If possible, I would like to conduct this interview between November 1st and December 1st.

If you are interested in being interviewed for this study please reply to my email at your earliest convenience. Additionally, if there are specific dates and times that would best fit your schedule, please forward that information as well.

In the meantime, if you have questions about the study, please contact me at [insert your email address] or my faculty adviser, Simon Funge, Ph.D., at (270) 659-6914 or [simon.funge@wku.edu](mailto:simon.funge@wku.edu).

Thank you in advance for your time and help.

Amanda Gallion

[Insert an email signature here.]

This email was sent as a response to educators who decided not to participate in the interview.

SUBJECT: Follow-up on Request to Participate in a Study on Teaching Environmental Sustainability

Mr. / Ms. [educator's name]

Thank you for your response to this email and your consideration of participating in this study. I want to assure you that your decision not to participate in this research study will not be shared with anyone at your institution. If you have any concerns or questions about this study, please don't hesitate to contact me at [Amanda.gallion245@topper.wku.edu](mailto:Amanda.gallion245@topper.wku.edu) or supervisor Simon Funge at [simon.funge@wku.edu](mailto:simon.funge@wku.edu).

Again, thank you for your time and response,

Amanda Gallion

[insert email signature]

## APPENDIX C

### TELEPHONE SCRIPT

This call was made after the initial email and only to those teachers who agreed to participate in the study one week prior to the scheduled interview.

1. Hello Mr. / Ms. [Educator's name].
2. This is Amanda Gallion, and I have been in contact with you through email concerning the research study that I am conducting.
3. Is this a good time to talk?
  - o No: When would be a more convenient time for me to contact you?

Date: \_\_\_\_\_ Time: \_\_\_\_\_. Thank you, I will call you at that time. In the meantime, if you have any questions regarding the research study, please refer to the letter I sent or contact me at (859) 625-2249 or at [Amanda.gallion245@topper.wku.edu](mailto:Amanda.gallion245@topper.wku.edu). You may also contact my faculty adviser, Dr. Simon Funge at (270) 659-6914 or [simon.funge@wku.edu](mailto:simon.funge@wku.edu). Good bye. [end phone call]
  - o Yes: Great! [proceed to #4]

4. I just wanted to contact you to confirm that you are still available for the interview we scheduled for [date, time and location].

o No: [inquire if there is another time or date that will work better]

o Yes: Great! Do you have any questions about what your participation will entail?

Answer questions.

o No: [proceed to #8]

o Yes: What questions do you have? Answer questions. [proceed to #8]

5. So, I plan to see you on [date] at [time] at [location]. If you have any questions or concerns in the meantime, please don't hesitate to contact me at (859) 625-2249 or Amanda.gallion245@topper.wku.edu. You may also contact my faculty adviser, Dr. Simon Funge at (270) 569-6914 or simon.funge@wku.edu. Thank you and good bye.  
[end phone call]

## APPENDIX D

### INTERVIEW GUIDE

#### Demographic Information

(Subjects will not be provided with this interview guide. For the demographic items the interviewer will then check the relevant categories and write in the Subject's response as applicable and if outside of the pre-selected categories)

What is your gender?

\_\_\_ F

\_\_\_ M

\_\_\_ Other response (specify):

What is your educational background?

\_\_\_ BA/BS in: \_\_\_\_\_

\_\_\_ MA/MS in: \_\_\_\_\_

\_\_\_ PhD/EdD in: \_\_\_\_\_

How many years have you been teaching? \_\_\_

How many years have you been teaching science? \_\_\_

What grade(s) do you currently teach science to?

\_\_\_4 \_\_\_5 \_\_\_6 \_\_\_7 \_\_\_8

How many students attend this school? \_\_\_

On average, how many students are in your science classes? \_\_\_

What is the approximate percentage of students who have Free and Reduced lunches at your school? \_\_\_\_\_

Category I:

R1: How do public school teachers (grades 4-8) who educate about environmental sustainability attempt to promote students' long-term commitment to promoting sustainability?

Prompt: "First, I'd like to ask you several questions about your personal teaching styles and techniques ..."

- o Q1: How would you define environmental sustainability?
- o Q2: What do you teach your students about environmental sustainability
- o Q3: To what extent do you integrate content on karst landscape into your teaching?
  - o A. Depending on answer follow up question: how do you approach teaching about water quality/pollution, radon gas, sinkholes, and cave systems?
- o Q4: How do you attempt to encourage students' long-term commitment to promoting sustainability?
  - o A. What teaching strategies do you use?
  - o B. To what extent do you collaborate with community-based organizations to address sustainability issues at your school?
  - o C. To what extent do you collaborate with community-based organizations to address sustainability issues in the community?

Category II:

R2: What factors do public school teachers who educate about environmental sustainability believe affect students' long-term commitment to promoting sustainability.

Prompt: "Next, I would like to ask you some questions about students' long-term commitment to promoting environmental sustainability ..."

o Q5: What factors outside of the classroom do you believe may undermine students' long-term commitment to promoting sustainability? (e.g., school colleagues, students' families, the broader community)

o Q6: What ideas do you have for addressing these factors?

o Q7: What factors outside of the classroom do you believe positively affect students' long-term commitment to promoting sustainability? (e.g., school colleagues, students' families, the broader community)

o A. What ideas do you have for promoting these factors?

Wrap-up Script

"Those are all the questions I have for you."

(If time permits) "Is there any other information you would like to add relative to education and sustainability that you did not cover or I did not ask?"

“I want to thank you for your thoughtful responses and the time taken from your busy schedule to sit down with me for this interview. As a reminder, you have the right to review the audio recording of this interview to determine whether it should be edited or erased in whole or in part.”

“If you have no further questions regarding this interview or the study, I want to thank you again for contributing your insights to my study. Thank you.”