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Implementation of the environmental issues instruction model by elementary teachers

Barbara Ann Ehlers
University of Northern Iowa

IMPLEMENTATION OF THE ENVIRONMENTAL ISSUES INSTRUCTION MODEL BY ELEMENTARY TEACHERS

An Abstract of a Dissertation

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

Approved:

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Dr. Jody Stone, Co-Chair

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Dr. Karla Krueger, Co-Chair

_____
Dr. April Chatham-Carpenter,
Interim Dean of the Graduate College

Barbara Ann Ehlers

University of Northern Iowa

May, 2015

ABSTRACT

Teachers attend many professional development experiences throughout their professional careers. Many teachers attend because they have a personal desire for professional growth. In addition, in the state of Iowa, they are required to engage in professional development to renew teacher licensure. Professional development is offered on a myriad of topics including the latest educational research on learning, innovations in curriculum, and instructional strategies to use in the classroom. However, just attending does not guarantee improved professional practice. After these experiences teachers may or may not implement the strategies, teaching methods, or information they have learned.

This qualitative study analyzed data collected from 15 teachers who implemented the environmental issues instruction (eii) model based on an environmental topic in their elementary classrooms. This model is a slightly modified version of a well-respected model originally developed by Dr. Harold Hungerford and his colleagues at Southern Illinois University, Investigating and Evaluating Environmental Issues and Actions (IEEIA). The teachers in the study attended a weekend professional development experience and a weekend update session a few months later. In the time between the initial session and the update session the teachers implemented the instructional unit in their classrooms.

The data were collected from several sources. The first consisted of two interview sessions. One was grade level group interviews completed at the professional development update sessions. The next was individual teacher interviews conducted by the researcher after the implementation of the unit and the update session. The second

source of data was comprised of the unit lesson plans developed by the teachers describing what they implemented in their classrooms. The third source of data was journals of two co-teaching experiences in which the researcher co-taught the environmental issues unit with elementary classroom teachers. The data were analyzed using the theoretical thematic analysis methodology (Braun & Clarke, 2013). The researcher developed themes based on the data that described how the teachers implemented the environmental issues unit in their classrooms following the professional development. An overarching theme of *Teacher Empowerment* was established from the analysis of the data.

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Dr. Linda Fitzgerald, Committee Member

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Dr. Benjamin Forsyth, Committee Member

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DEDICATION

I dedicate this dissertation to my best friend and husband, Don, who sat quietly in his chair while I labored over this. He waited patiently for me to finish so we can return to playing with our grandchildren, biking, and traveling. He supported me in every step of this journey. I appreciate it more than anyone will ever know. I also want to dedicate this to my children, Angie and Brett and their spouses, Dan and Nicky, and our grandchildren, Payton, Jack, Grady, Stanley, and Stanley's future sibling. They are all the lights of my life and the reason I endeavor to become the best educator possible.

I would be remiss not to mention my colleagues at Upper Iowa University, who encouraged and supported me along the way. If it weren't for them and Upper Iowa University, I would not have taken on this endeavor. I also want to recognize my education students at Upper Iowa who challenge me each and every day to help them become our future in education.

And last, but not least, Dr. Carl Bollwinkel, Barbara Bonnett, and Rosie Cochran-Thompson, who introduced me to the Environmental Issues Instruction (eii) Model many years ago, and taught me a great deal about preparing quality curriculum materials and delivering environmental issues professional development.

ACKNOWLEDGMENTS

A special thanks to Dr. Jody Stone and Dr. Karla Krueger for serving as co-chairs of my dissertation team. Jody's expertise in science education and experience with the IEEIA instructional model was invaluable. Karla's role as the APA queen as well as wordsmith assisted me in improving and enhancing my dissertation. Thanks to Dr. Linda Fitzgerald for challenging me to think deeper and more clearly about my research. Lastly, thanks to Dr. Benjamin Forsyth for his assistance in inspiring me to look at the data in a plethora of modes.

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INTRODUCTION

Teachers attend many professional development sessions throughout their academic careers. According to Gusky (2000), improving the knowledge, skills, and attitudes of teachers are major goals of professional development. Professional development is crucial to ongoing learning for educators. Guskey (2000) explains, “one constant finding in the research literature is that notable improvements in education almost never take place *in the absence* of professional development” (p. 4). Many teachers attend because they have a personal desire for professional growth. In addition, in the state of Iowa, they are required to engage in professional development to renew teacher licensure. Professional development is offered on a myriad of topics including the latest educational research on learning, innovations in curriculum, and instructional strategies to use in the classroom. However, just attending does not guarantee improved professional practice. After these experiences teachers may or may not implement the strategies, teaching methods, or information they have learned.

Evaluation of professional development is imperative to determine what teachers take away from the experience and how they actually use the learning in the classroom. Guskey (2000) expounds, “Gathering and analyzing information about whether or not new practices are used, and how well they are used, are essential activities in evaluating professional development programs and activities” (p. 181). Data obtained for evaluating the impact of a professional development experience will offer valuable information to both those delivering the professional development and those engaged in it. Zepeda

(2013) advocated for an engaging process of evaluating professional development with the involvement of stakeholders in collecting information about the impact and interpreting the results. This study used components of three professional development evaluation models to analyze systematically collected information about classroom teachers' implementation of their professional development experience. Those models were Guskey (2000), Kirkpatrick and Kirkpatrick (2006) and Zepeda (2013) as shown in Table 1. Zepeda (2013) generalized the evaluation process commonly used to assess professional development: "a focus is selected; data is collected; organized and analyzed; and results are reported to stakeholders" (p. 34). Kirkpatrick and Kirkpatrick (2006) and Guskey (2000) both have developed models for evaluating professional development in educational settings. These specific models had steps that determined what and how teachers implement what they learned. Level three of the Kirkpatrick and Kirkpatrick (2006) Model sought to measure the "transfer of knowledge, skills, and attitude" to the work setting (p. 52). Level four of Guskey's (2000) professional development evaluation model is similar to Kirkpatricks' because it focused on the use of "new knowledge and skills" (p. 178). These two aspects of evaluation offered a framework for this study of the data collected which signified how teachers applied information and instructional strategies learned in professional development.

Table 1

Comparison of Three Models of Professional Development Evaluation

Kirkpatrick and Kirkpatrick Model of Professional Development Evaluation	**Guskey's Model of Professional Development Evaluation**	**Zepeda's Evaluation Process for Evaluation of Educational Programs**
1. Reaction evaluation is how the participants felt about the training or learning experience.	1. Participants' Reactions	1. Select a focus.
2. Learning evaluation is the measurement of the increase in knowledge - before and after.	2. Participants' Learning	2, Data is collected.
3. Behavior evaluation is the extent of applied learning back on the job - implementation.	3. Organization Support & Change	3. Data is organized and analyzed.
4. Results evaluation is the effect on the environment by the trainee.	4. Participants' Use of New Knowledge	4. Results are reported to stakeholder.
	5. Student Learning Outcomes	

An end result of professional development for teachers is learning and change. Kirkpatrick and Kirkpatrick (2006) described the learning that takes place during professional development as both changing attitudes and improvement in knowledge and skills. Zepeda (2013) further explained the importance of understanding the dynamics of change related to learning. Moreover, the implementation of the new learning from

professional development is reliant on a variety of factors. According to Kirkpatrick and Kirkpatrick (2006),

> In order for change to occur, four conditions are necessary:
>
> 1. The person must have the desire to change.
> 2. The person must know what to do and how to do it.
> 3. The person must work in the right climate.
> 4. The person must be rewarded for changing (p. 23).

These four factors of change influence the resulting implementation of professional development in classrooms. In this study, data documenting the actions of the teachers following the professional development experience were examined, analyzed and described in search of evidence of learning and change and the teachers' transfer of knowledge, skills, and attitude to the work setting.

The Environmental Issues Instruction (eii) Model

This study focused on how elementary teachers implemented the thematic interdisciplinary instructional model learned through a specially tailored professional development experience, a four-step instructional model of Environmental Issues Instruction (eii). The eii program is based on a model developed in 1980 by Dr. Harold Hungerford of Southern Illinois University in Carbondale, Illinois. He and his colleagues have used this thematic interdisciplinary model of environmental issues investigation for the past three decades (Marcinkowski, 2001). The IEEIA model, was developed in response to the first Intergovernmental Environmental Education Conference in Tbilisi, Georgia (USSR) in 1977 which produced the Tbilisi Declaration (United Nations

Educational, Scientific and Cultural Organization, 1977). Hungerford, Peyton, and Wilke (1980) operationalized the Tbilisi objectives and developed the four goal levels for environmental education curriculum development. The goal levels included:

1. ecological foundations,
2. conceptual awareness of issues and values,
3. issue investigation and evaluation, and
4. citizen action skills (Hungerford, Litherland, Peyton, Ramsey, & Volk, 1990, pp. 201-203).

Even though the IEEIA model was first developed in 1980, it is still well respected in the field of environmental education. The North American Association of Environmental Education (NAAEE) used the IEEIA model to develop guidelines for teaching environmental education in the United States (NAAEE, 2010). The influence of the IEEIA model is evident in the NAAEE (2010) Guidelines for Excellence. “These guidelines set a standard for high-quality environmental education across the country, based on what an environmentally literate person should know and be able to do” (p. 1).

Dr. Harold Hungerford and his colleagues have conducted extensive research on the IEEIA model. In a study released in 2000, Hungerford, Volk, and Ramsey compiled research findings from 11 studies from 1979-2000 focusing on issue oriented citizenship decision-making, specifically in relation to classroom strategies designed to permit students to think through issues and actions. All studies used an experimental approach to assess students’ learning and were conducted in formal classrooms in a variety of grade levels (fifth through eighth) and in a variety of settings. In the studies, classes instructed

in issues instruction were compared with classes receiving traditional content instruction. The majority of behaviors measured showed significant difference in those who had received the issues instruction.

Subsequently, the IEEIA model was adjusted and used in additional professional development settings. Dr. Carl Bollwinkel was one of Hungerford's colleagues at Southern Illinois before his appointment at the University of Northern Iowa. Dr. Bollwinkel and two Iowa teachers, Rosalie Cochran-Thompson and Barbara Bonnett began conducting environmental workshops together in the 1980's. Rosie Cochran-Thompson attended a six-week seminar in Carbondale with Hungerford in 1987 to learn how to use this teaching model in her middle school classroom. Bollwinkel, Bonnet, and Cochran-Thompson began structuring their environmental issues workshops using the Hungerford model (R. Cochran-Thompson, personal communication September 18, 2011). The present eii program was developed from those workshops. The eii teaching model embodies four very similar levels:

1. Level I: Issue Analysis,
2. Level II: Ecological Foundations,
3. Level III: Issue Study, and
4. Level IV: Responsible Environmental Action

The eii model evolved from that IEEIA model. A comparison is made in Table 2 showing the IEEIA (Hungerford) model, the NAAEE Guidelines for Excellence, and the eii model.

Table 2

Comparison of Three Models of Environmental Education

IEEIA (Hungerford) model	NAAEE Guidelines for Excellence	eii model
Goal Level I: Ecological Foundations	**Strand 1**: Questioning, Analysis and Interpretation Skills	**Level I:** What is an Environmental Issue?
Goal Level II: Conceptual Awareness of Issues and Values	**Strand 2:** Knowledge of Environmental Processes and Systems	**Level II:** What are the ecological foundations?
Goal Level III: Issue Investigation and Evaluation	**Strand 3:** Skills for Understanding and Addressing Environmental Issues	**Level III:** What are the local environmental issues?
Goal Level IV: Citizen Action Skills	**Strand 4:** Personal and Civic Responsibility	**Level IV:** What is appropriate responsible environmental action?

There are two basic differences between the Hungerford Model and the eii model. One difference is that the eii model changed the order of the first two levels during the professional development events. As noted in Table 2, learning about environmental issues first aligns with the recommendations from the NAAEE environmental education guidelines. This change supports teaching about problems and issues first for pedagogical reasons. The eii team also believed it was a better fit for their workshop schedule for teachers. Based upon their experiences with professional development for practicing teachers, the eii team also felt it was received well in that manner by teachers in their workshop experiences (C. Bollwinkel, personal communication, September 18, 2011). Teachers arrive for the workshop on a Friday evening and begin the professional

development immediately after a full week of teaching. The Hungerford version starts with the ecological foundations which seemed to be demanding learning for a Friday evening. Conversely, learning about what constitutes an environmental issue using *The Lorax*, by Dr. Seuss (1971) is a distinct concept that can be delivered in its entirety in a Friday evening session and the more complicated and lengthy ecological concepts take place on Saturday after a restful evening.

The second difference between the two models is the target population for the professional development workshops. Whereas the Hungerford model was developed for use with middle school or junior high teachers and their students (Hungerford et al., 1990), the eii professional development experience was designed for elementary teachers as well as middle and high school teachers.

Although the Hungerford model focused on middle school teachers and students, the NAAEE (2010) guidelines supported teaching environmental education to younger students:

> In these early years of formal education, learners tend to be concrete thinkers with a natural curiosity about the world around them. Environmental education can build on these characteristics by focusing on observation and exploration of the environment—beginning close to home (p. 11).

While extensive research has been done with middle and high school teachers with the similar IEEIA model, little research has been done with elementary teachers and how they implemented the model in their classrooms. The eii instructional model has been used with teachers of all content areas and grade levels from kindergarten through grade 12 for over 25 years, but no qualitative research has been done of the eii model and the implementation in the classroom.

My eii Story

As a young first grade teacher, I loved to teach science and sought out professional development opportunities that focused on science education. That is how I first became involved with the eii program in 1989. For several years, I attended workshops based on different theme topics and taught the units in my first grade classroom. The facets that intrigued me included the interdisciplinary approach to the instruction and the focus on learning about the environment and its problems and issues. The integration of science concepts through the use of children's literature was also appealing. I garnered new ideas, materials, and instructional strategies from these eii workshops. This type of thematic instruction impacted the way I taught in my own classroom. However, modification of the lessons and activities presented in the eii workshops were often necessary for use with my first graders. Eventually, I was invited by the eii team of Bollwinkel, Bonnett, and Cochran to become an eii teacher leader and to assist in preparing and leading workshops with them. After more than 10 years of working with them, I was asked to become the director of the eii program. Since my initial involvement in the program, I have always been very interested in how and to what degree others implemented these units into their classrooms, especially at the elementary level. The eii team has always used pre- and post-test assessments with both the teacher participants and their students. These assessments provided quantitative information about knowledge gained during the eii workshop for the participating teachers and during the unit for their students. The T-scores resulting from those assessments were included in grant requests, grant reports, and presentations at local, state, and national conferences. Typically, a graph would show

the increase of knowledge before and after the workshop or teaching of the unit. The results were always statistically significant. As a teacher-leader and director of the eii program, I often wished for deeper, more descriptive data that would explain in detail what took place after the workshop in the classrooms, what worked and what didn't, especially for elementary teachers.

Interdisciplinary Teaching and Learning

The eii model of environmental issues instruction was chosen for this study because there was a lack of research targeting elementary teachers' implementation strategies for eii professional development. Additionally, the interdisciplinary nature of the model fits well with the expectations that all content areas are taught in elementary classrooms. The use of the thematic, interdisciplinary instructional approach was well documented in educational research. Dr. Heidi Hayes Jacobs (1989), Executive Director of the *Curriculum Mapping Institute and President of Curriculum Designers, Inc*., is an internationally recognized expert in the fields of curriculum and instruction. She defined interdisciplinary teaching and learning as a "curriculum approach that applies the knowledge and methods of more than one discipline to learn about a common topic, theme, or problem" (p. 8). Environmental education does not fit easily into the traditional content categories such as language arts, math, social studies, and science. The complexity of environmental topics as well as the relationship to learning science through environmental issues add to the conundrum. Examples of environmental topics and issues are water quality, wildlife habitats, energy use, and establishing prairie areas. "According to Paul and Volk (2002), to understand and deal with these issues, one must draw on

knowledge and skills from a variety of subjects" (p. 11). In Kohl's 1995 book, *I Won't Learn From You*, he addressed the problem of teaching strategies that do not lead to student learning. He recalled experiences of his own as a student and as a veteran teacher of all levels, from elementary to graduate school, and explained how crossing disciplinary boundaries led to a richer learning environment. Kohl (2010) also believed that the related ideas of offering students choices, mixing various types of grouping, providing rich resources, and drawing on students' personal experiences enhanced interdisciplinary learning experiences. Interdisciplinary strategies used in the classroom gave students a chance to make connections with their own lives. Kohl's description of interdisciplinary teaching and learning fit well with the interdisciplinary nature of the environmental education models.

Zepeda (2013) provided support for professional development and outlined the following principles of adult learning and strategies to engage adult learners:

- Make learning both an active and interactive process.
- Provide hands-on, concrete experiences and real-life experiences
- Employ novelty, but also connect to the adult learners' prior experiences and knowledge.
- Give them opportunities to apply the new knowledge to what they already know or have experienced.
- Be aware of the diversity in an adult group. Use a variety of approaches to accommodate different learning styles.
- Use small group activities through which learners have the opportunity to reflect, analyze and practice what they have learned.
- Provide coaching, technical assistance, feedback or other follow-up support as part of the training.
- Give adult learners as much control as possible over what they learn, and other aspects of the learning experience. (p. 47).

Interdisciplinary teaching and learning may or may not be new to elementary teachers. Professional development opportunities using a thematic approach with environmental education as a backdrop may give them the opportunity and instructional strategies to employ interdisciplinary teaching in their classrooms.

Implementation of Professional Development

Guskey (2000) provided several reasons to investigate teachers' implementation of professional development. He believed that professional development activities can improve student learning: "For a professional development program or activity to lead to improvements in student learning, it must first enhance the knowledge and skills of participating educators" (p. 122). Data gathered from professional development participants can provide evidence of the learning that took place to determine if the workshop was effective and useful. Another reason for examining teachers' learning is to gauge the effectiveness of the experience. Time is valuable in education and should not be spent in ineffective events. The third reason for collecting information on participants' learning is that such evidence is vital to implementation. Using new ideas or practices well typically requires deep conceptual understanding on the part of the implementers. Teachers must know which aspects of a new approach or innovative methodology are most crucial to program fidelity. They also must develop the skills necessary to make appropriate contextual adaptations (p. 122).

This study investigated the data previously gathered about the implementation of the eii instructional model in elementary classrooms with the goal of providing educators with valuable information about the professional development experience and the

extrapolation to the teaching practices in the classroom. Professional development facilitators will receive feedback about the most commonly used lessons and activities and how successful they were. Teacher participants executed what they learned in the professional development experience in a variety of ways. The choices made by teachers in regard to lessons and activities, and the modifications made for elementary students were described and shared with interested educators.

Research Questions

The focus of this study was to analyze and investigate the data that described how elementary teachers implemented the four steps of the eii instructional model and how they chose to modify activities and assignments in their own classrooms. Through group and personal interviews the teachers explained exactly which activities and lessons they used and what modifications they made when they returned to their classrooms. The unit lesson plans they developed were also used as evidence of the implementation. I explored the teachers' interview responses, their unit lesson plans, and the journals I kept when co-teaching the eii instructional model with two fourth grade teachers for successes and challenges of implementation and described common themes from this data.

This research:

1. Examined how elementary teachers implemented each level of the environmental issues instruction (eii) model in their classrooms.
2. Identified the successful and challenging components of the implementation.
3. Established common themes from their responses.

The research questions were as follows:

1. How did elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?
2. Why did elementary teachers modify lessons and activities when implementing the environmental issues unit in their classrooms?
3. What effect did the eii professional development experience have on the participating teachers?

Interviews of the participants allowed for a comprehensive description of the implementation of the instructional model and how it was used in the classroom. In Guskey (2000): “The detail and richness of the information they provide is impossible to attain from a pencil-and-paper evaluation form” (p. 133).

Fifteen elementary teachers who participated in the eii professional development training during the 2012-2013 and 2013-2014 academic years consented to be participants in data gathering about the eii professional development experience. They were interviewed as a grade-level group at the update session for the professional development and interviewed individually at a later date at their convenience. The interviews were framed around the four levels of the eii instructional model. Teachers were also asked to expound on the successful and challenging components of their implementation. They created unit plans including the lessons and activities they used with their students that were used as reference in the interview sessions. These unit and lesson plans were initially used as assessment by the researcher to post grades for the gradate credit the teachers received. I co-taught the eii unit with two teacher participants

in the spring of 2013 and the spring of 2014. I kept journal entries describing the implementation. Information from the interviews, lesson plans, and journal entries were analyzed for this study.

CHAPTER 2

REVIEW OF THE LITERATURE

This qualitative study examined data collected from elementary teachers who implemented an environmental issues instruction (eii) model in their classrooms following a professional development experience. The instructional model provided the framework for the professional development and the application in the classroom, but there were other factors that impacted the resulting execution by teachers. This literature review encompasses vital defining aspects of this type of professional development. Research of the following attributes are included:

1. The Hungerford Model, (IEEIA)
2. Interdisciplinary teaching and learning
3. Constructivist, investigative, hands-on, inquiry-based techniques in science education.
4. Effective professional development for teachers
5. Teacher enthusiasm and empowerment
6. Professional development research using data from interviews

The literature review for this study was divided into six components. The first focused on the prior research based on the Hungerford Model, (IEEIA), and specifically those studies based on implementation. The second centered on interdisciplinary teaching and learning as demonstrated in the professional development and the implications for elementary teachers. The third examined the modeling of investigative, hands-on, inquiry-based teaching and learning as experienced in professional development

experiences. The fourth dealt with studies on components of effective professional development. The fifth focused on teacher enthusiasm. The consideration of the research previously done in these areas provided a grounded understanding of this type of professional development, the implementation, and the need for further research. The final portion of the literature review concentrated on the use of interviewing in qualitative research and the analysis of existing data.

Hungerford Research

The IEEIA model was developed by Dr. Harold Hungerford and his colleagues at Southern Illinois University. They conducted extensive research based on the usage of the (IEEIA) instructional model. The research done on the implementation of IEEIA model focused on the four goal levels. This review concentrated on IEEIA studies that focused on implementation.

Paul (2001) used quantitative and qualitative methods that determined the success rate, identified key variables of IEEIA implementation, and investigated barriers to complete implementation. In the quantitative component of the study, a direct-mailed nine-page survey was returned by 132 of 251 teachers who participated in the IEEIA training in the 10-year period from 1990-1999. Twenty-five percent of the 132 were elementary teachers, but the resulting data did not separate them from the middle school and high school teachers to determine the effectiveness at the elementary level. For the qualitative aspect, a purposive sample of six middle school teachers were interviewed. The author examined the length of the training; “the perception of support; the participants’ perceptions concerning the instructional approach on the stakeholders

involved including the teachers, students, administrators, colleagues, parents, and community; and barriers to implementation" (p. 10). Following are Paul's (2001) conclusions based on quantitative findings:

1. It is critical that sufficient support be provided to teachers as they implement comprehensive and interdisciplinary environmental education programs like IEEIA from administrators, peers, the IEEIA trainer, parents, and the community.
2. Participants who used the team approach had more success in terms of their continued use of the curriculum than teachers who taught alone. Because of this, workshop recruiters should focus on grade-level teams from different content areas and on teachers in self-contained classrooms.
3. Trainers should incorporate time into the training sessions that would allow teachers to plan their implementations and reflect on their implementation plans with peers and trainers.
4. Teachers who already use the integrated approach should interact with workshop participants and relate their experiences. Trainers should also encourage participants to commit to using the approach in their classrooms for a minimum of a two to three year period.
5. Trainers and school administrators should provide a variety of support structures during the first year of implementation. These include onsite visits by the trainers, group and trainer meetings, and a communication network (pp. 160-161).

In the qualitative section of the same study, six middle school participants were interviewed about their implementation of the IEEIA model in their classrooms. Conclusions included the following:

1. All of the teachers who had implemented the approach believed their students were positively impacted as a result.
2. The teachers believed the IEEIA curriculum had helped them become better teachers.
3. The teachers believed their students have made real contributions to their communities as a result of the incorporation of the IEEIA curriculum into classroom instruction (p. 146).

Despite the useful recommendations given, the quantitative data about the implementation at the elementary level was not analyzed separately to allow examination at that level. The qualitative interviewing did not include elementary teachers.

In another study of the IEEIA model, Winther, Volk, and Shrock (2002) completed a qualitative study of teacher decision making in the first year of implementation. Eight teachers were interviewed in three separate sessions: immediately following the in service, at midyear and at the end of the academic year in which they implemented the IEEIA model. Of the eight, three were high school teachers, two were middle school teachers and three were designated as elementary teachers, but taught sixth grade, which is often included in middle school. The study revealed aspects of this training that differed from traditional educational methods based on content delivery. Those aspects included an emphasis on skills development and application. Facts and concepts were learned alongside the model as students researched to find out what they did not know in order to learn more about the target environmental issue. Another difference was the role of the teacher because of the hands-on learning of the students. The activities were student-directed putting them in charge of their own learning. A final difference was the emphasis on real-world examples of the environmental issues rather than an emphasis on the goal of academic knowledge. The content learning actually took place within the study of the environmental issue theme. These changes were significant for teachers because they were in contrast to traditional teaching and learning.

Recommendations from the study focused on administrative support for teachers who changed their instructional delivery from a focus on content to a focus on the

process of learning. Administrators should provide incentives for staff development including graduate credit and stipends. Teachers should receive training in metacognitive strategies to understand the change process. Additionally, emphasis that this type of instruction should meet other goals of the school such as use of information technology, cooperative learning, project learning, authentic assessments, higher-order thinking skills, interdisciplinary curriculum, and student-directed learning. The results were not separated by elementary, middle, and high school teachers making it difficult to discern if these results differed at the various levels. Elementary teachers below sixth grade were not included in the study.

Volk and Cheak (2003) also evaluated the impact of the IEEIA environmental education program used with fifth and sixth graders on the island of Molokai, Hawaii. The two-year program of issue investigation was an umbrella for all content areas. The longitudinal qualitative and quantitative study measured the influence on teachers, students, parents and the community. Teachers commented that the program had a liberating effect by unifying the learning because of the use of the instructional model. They felt more like a guide for students' learning, rather than the leader (p. 13). Results showed the use of the IEEIA instructional model revealed learning for the teachers went beyond content knowledge. Teachers also changed their methods of delivery and extended learning for their students to include citizen behavior actions. The quantitative aspect of the study compared 101 fifth and sixth grade students. They were assigned to four fifth-sixth grade combination classrooms with 25-26 students per classroom. Two classrooms were taught in a traditional manner and two were taught using the issues

investigation approach. All students were given a critical thinking assessment and environmental literacy instruments at the end of the year to compare the two groups. Quantitative findings showed, “students who experienced the issues instruction approach appeared to be more skilled in dimensions of critical thinking than students who had no direct experience with the program” (p. 17). Students also exhibited more knowledge of both ecology and the environment as indicated by the results of the environmental literacy assessment. Again this study focused only on upper elementary students, often considered middle school.

Hungerford, Volk, and Ramsey (2000) compiled research findings from 11 studies using a quantitative experimental treatment approach between 1979 and 2000 with fifth through eighth grade students. These studies focused on issue oriented citizenship decision-making, specifically in relation to classroom strategies designed to permit students to think through environmental issues and actions. All studies used an experimental approach and were conducted in formal classrooms at a variety of grade levels and in a variety of settings. In the studies, classes trained in issues instruction were compared with classes receiving typical instruction. The areas that showed the biggest differences between the two groups were citizen behaviors, environmental problem identification, and environmental sensitivity (pp. 127-140). Once again, elementary teachers and students were not included in the study.

In 2008 and 2011, McBeth, Hungerford, Marcinkowski, Volk, and Cifranick completed a quantitative comparative analysis of middle school students in Phase I (2008) and Phase II (2011) of the National Environmental Literacy Assessment (NELA).

Phase I of NELA obtained baseline data from schools throughout the United States. The study included 93 teachers and 2,004 sixth and eighth grade students in 48 classes not involved in any environmental education program. The teachers filled out a survey about environmental education and the students were given a proctored assessment of their environmental knowledge based on the four levels of the IEEIA model. Phase II of NELA generated information from 214 teachers, 64 schools, and 7,965 students currently involved in environmental education programs and did a comparative analysis to Phase I. Teachers again filled out the same survey and students were given the same proctored assessment. Students in the Phase II of the study exhibited significantly higher levels of environmental literacy on the variables of "ecological knowledge, verbal commitment, environmental sensitivity, environmental feelings, and actual commitment (behaviors), than their counterparts from the random sample" (p. 104). As in previous studies, there were none included lower than sixth grade including teachers or students. Details about what was taught in these environmental programs were not included in this quantitative study.

Summary of Hungerford Research

The Hungerford model of environmental issues investigation has greatly influenced environmental education in the United States since its origin. The studies focused on implementation offered positive data to support environmental education professional development for teachers and impacted the students in their classrooms. The research conclusions advocated positive impacts on teachers as well as their students. Teachers learned how to engage students in learning, based on environmental issues.

They enhanced their instructional strategies while students became critical thinkers. And together, these teachers and their students positively impacted their communities.

The majority of the studies used quantitative methods, with some qualitative research present. The emphasis in most studies was middle school students and teachers. Elementary teachers comprised a small number and those included were upper elementary teachers and students, which could be classified as middle school. Those few that included elementary did not separate the data to allow for examination of the implementation at the elementary level.

Studies of the IEEIA model of environmental issues instruction revealed valuable knowledge relating to both student achievement and a change of the teacher's role in delivery. The students were more involved and engaged in their learning which resulted in citizen action skills. This type of theme-based instruction crosses all content areas and is referred to as interdisciplinary education. Research on interdisciplinary instruction offered insight into how theme-based professional development might play out in the classroom.

Interdisciplinary Teaching and Learning

Dr. Heidi Hayes Jacobs (1989) Executive Director of the *Curriculum Mapping Institute and President of Curriculum Designers, Inc*., is an internationally recognized expert in the fields of curriculum and instruction; she offered the following definition of interdisciplinary teaching and learning: "Interdisciplinary: a knowledge view and curriculum approach that consciously applies methodology and language from more than one discipline to examine a central theme, topic, issue, problem, or work" (p. 8). In

elementary classrooms, teachers are expected to teach all subject areas. The ability to integrate learning around a central theme or topic is one way to accomplish that task as well as to incorporate the mandated standards of all content areas.

This methodology was introduced 75 years ago, but never has been used extensively in the educational system. John Dewey (1938) wrote about experience and education:

> Experiences in order to be educative must lead out into an expanding world of subject-matter, a subject-matter of facts or information and of ideas. This condition is satisfied only as the educator views teaching and learning as a continuous process of reconstruction of experience (p. 87).

Experience and education can and do happen in interdisciplinary learning. Dewey also believed strongly in a problem-solving model, explaining, "the experimental method of science attaches more importance, not less, to ideas as ideas than do other methods. There is no such thing as experiment in the scientific sense unless action is directed by some leading idea" (p. 86). Interdisciplinary models suggested that students were studying ideas, problems, and issues, rather than just content. Throughout the years, other educational experts held similar views about how educational experiences should be constructed and carried out.

Hilda Taba (1962) well known for her work in curriculum development was a proponent of interdisciplinary learning in the 1960's. She referred to it as curriculum integration and spoke of the benefits.

> It is recognized that learning is more effective when facts and principles from one field can be related to another, especially when applying this knowledge. Would not the insights gained about American life from reading American literature enrich the perceptions gained from the study of history (p. 298).

Much like Dewey's beliefs, she felt the experience of the individual student was integral in this process. Curriculum integration reminiscent of Taba is inherent in the eii instructional model. While students are focusing on the environmental problems and issues, the other content areas are imbedded in the learning. Along with scholars like Taba and Dewey, professional organizations have also supported interdisciplinary education.

In 1995, a joint position statement by six professional organizations endorsed interdisciplinary education: the National Council of Teachers of English (NCTE), the International Reading Association, the National Council for the Social Studies, the National Council of Teachers of Mathematics, the Speech Communication Association, and the Council for Elementary Science International. The NCTE (1995) issued statement explained the value added to education for students that experience interdisciplinary learning: "An interdisciplinary education which draws from the knowledge and processes of multiple disciplines should encourage students to become active learners equipped with the analytical, interpretative, and evaluative skills needed to solve real-life problems" (para. 5). These national and international professional organizations officially supported interdisciplinary teaching and learning, but a 2013 release of a new set of science standards provided the actual integration of science, literacy, and mathematics.

The National Science Teachers' Association (NSTA) and the National Research Council (NRC) released the *Next Generation Science Standards* (NGSS). Interdisciplinary teaching and learning are inherent in the pedagogy of these standards. One aspect of the NGSS is crosscutting concepts. The NRC Framework describes

crosscutting concepts as those that bridge disciplinary boundaries, having explanatory value throughout much of science and engineering. Crosscutting concepts help provide students with an organizational framework for connecting knowledge from the various disciplines into a coherent and scientifically based view of the world (Achieve, 2013).

Each Disciplinary Core Idea (DCI) of the NGSS included correlation with national mathematics and literacy standards. These new science standards provided teachers with concrete examples of the integration of those three content areas. The opportunity to teach and learn in an interdisciplinary manner not only addressed content standards, but provided evidence of increased student learning.

Interdisciplinary teaching and learning provided evidence of positive effects on reading comprehension when coupled with science education. From 1992 – 2012, Romance and Vitale conducted seven quantitative studies examining the implementation of a multidisciplinary integration of reading and science of elementary students. All studies used demographically comparable classes as controls. In Romance and Vitale's (2012) first study, three fourth grade classrooms implemented the integration of reading and science and were compared with similar classrooms without the treatment. Standardized test results for science and math were significant for those students experiencing this approach. In 1993, Romance and Vitale (2012) replicated the previous study with similar results on standardized testing of science and reading. A 1996 study of 15 fourth and fifth grade classrooms composed of primarily at-risk students again showed significant gains on the standardized tests. A 1998 study of 45 classes of fourth and fifth grade classrooms of regular and at-risk students again showed significant gains in reading

and science achievement. A multi-year study from 2002-2007 of third through fifth graders in 12 schools which examined the transfer effects assessed in grades six through eight also showed significant gains for those students who had experienced the multidisciplinary approach compared to those who had not. In 2005, two schools implemented the multidisciplinary approach in first and second grades. Students were tested the following year and again showed higher achievement scores when compared with those who had not. The study was replicated in 2007 with similar results. These studies, Romance and Vitale (2012) found that integrating these two content areas increased the achievement of the students in both areas: "The findings of this multi-year, cross-sectional study substantially extend previously reported research demonstrating the effectiveness of content-area learning in science as a means for improving student reading comprehension" (p. 6). The quantitative results of these seven studies positively support the integration of science and literacy with the increase in student achievement on standardized tests. Qualitative information with specific details of how this is implemented would be helpful to elementary teachers wanting to teach science and literacy simultaneously and assist them in meeting required content standards.

Summary of Interdisciplinary Teaching and Learning

Many states have adopted the *Common Core Standards* (Common Core State Standards, 2014) as a basis for all instruction. One of the biggest shifts in the Common Core Literacy Standards is that students are expected to read more informational pieces rather than fiction. Another aspect of the Common Core is that all teachers are expected to teach literacy regardless of the content area. This certainly opened the door to

interdisciplinary education. This research-based support of interdisciplinary instruction and the connection to the standards-based movement in the United States provides evidence for its use in professional development and in the classroom.

Constructivism, Investigative, Inquiry-based, Hands-on Teaching and Learning

Although most agree that learning should be an active, engaged event, many times that is not the case in professional development. Loucks-Horsley, Stiles, Mundry, Love, and Hewson (2010) state teachers should experience learning in the same way as their students.

> The fact remains that the field of education is living in a paradox of knowing one thing and doing another. For example, we say we know that learning experiences should be active, coherent, and relevant, yet too much of student learning and professional development is still not interactive or reflective and remains disconnected from practice (p. 64).

In an experiential professional development event, teachers were actively involved in a constructivist manner with the activities and lessons they used with their own students when returning to the classroom. They asked questions, investigated, researched, and searched for solutions to problems and issues. Many teachers had not been subjected to this type of learning in their own educational experiences. Experiencing constructivist learning through professional development offered teachers that background. A variety of studies support experiential learning for teachers in professional development.

In a 2001 empirical study of characteristics of professional development involving 783 mathematics and science teachers, Garet, Porter, Desimone, Birman, and Yoon (2001) reported “opportunities for active learning” (p. 916) as one of the three components of effective professional development. Data were collected from teachers in

the Teacher Activity Survey used as an evaluation tool of various professional development experiences funded by the Eisenhower Professional Development Program. This survey was mailed to the participating teachers. While the quantitative information gives statistics about professional development, specific details about the implementation of the professional development content and skills were not provided.

Zwiep and Benken (2013) in a mixed methods study examined 103 fourth through ninth grade math and science teachers' experiences with active learning in professional development. The teachers in this study experienced science and math concepts as adult learners. The professional development leaders modeled the practices and approaches the teachers would eventually implement in their classrooms. Data were collected from pre- and post-surveys, pre- and post-content exams, daily institute reflections, post institute reflection surveys, practice-based interviews, and instructor/research journals. Three themes emerged from this study in regard to professional development delivered in an experiential manner. Those included nature of the discipline, learning of the discipline, and how students learn content (p. 314). The qualitative and quantitative analysis of the data focused on the learning of the teachers, not exactly what they implemented in the classroom.

Klein and Riordan (2011) focused on experiential environmental expeditions as professional development for teachers. This qualitative case study used a variety of methods for this case study of eight high school teacher participants from New York City. Methods included interviews, observations, and student work. Their findings supported the use of constructivist learning for teachers in professional development.

"Using experiential strategies, where teachers engage in intensive versions of expeditions they are expected to construct for their students, contributes to the successful teacher implementation of professional development" (p. 43). In this type of professional development, the teachers experienced what they would in a manner similar to their students. Klein and Riordan also explored how teachers' experiential learning affected the implementation of the professional development in their classrooms. They found many teachers used identical materials and methods from the professional development. This process was an essential step to internalizing and transforming the strategies for use in other content in the future. This type of experience gave teachers the background to teach in an investigative manner. The qualitative method in this study provided in depth information about actual implementation following professional development, but was limited to high school teachers.

A 2012 qualitative study by Bell and Odom of university professors who delivered professional development used the science inquiry process, specifically, the learning cycle, with 20 fourth- through ninth-grade teachers, endorsed the importance of active engagement. Data were collected through observations and interviews. Results showed teachers must experience the "authentic inquiry process" (p. 619) before they incorporated this pedagogy into their instruction. Once again, the data were not separated by elementary and middle school to allow for examination of the results for just elementary teachers.

Lewis, Kraft, Watts, Baker, Wilson, and Lang (2011) determined that modeling and participation during professional development presented to elementary teachers in an

inquiry-based professional development on the theme of flooding not only gave them experience in investigative learning, but improved their science content knowledge. Seventeen fifth and sixth grade teachers were given a pre- and post-test based on the content of the professional development experience. Three of the teachers provided more in depth data as they completed reflective pieces about their learning experiences. The results focused mainly on the improvement of the teachers' content knowledge as a result of the professional development, not necessarily tied to the experiential learning as proposed. Once again, teachers from lower elementary grades were not included in the study.

Inquiry-based instruction is not inherent for most teachers, so offering that experience in professional development is valuable for teachers' learning. A literature review by Capps, Crawford and Constas (2012) focused on 17 programs in 22 empirical studies that purported using inquiry-based professional development. All articles included in the study provided data that reported on teacher knowledge, changes in teacher beliefs or practice, or student achievement. All programs emphasized the importance of supporting teacher learning during inquiry, but this literature review pointed out that none of the studies included all of the components of effective professional development; total time, extended support, authentic experience, coherency, developed lessons, modeled inquiry, reflection, transference, and content knowledge. The results also accentuated the magnitude of science content knowledge of teachers for them to be successful in teaching inquiry-based science. Recommendations were that "studies be designed to investigate the connections between the design of inquiry-focused PD, teacher knowledge, changes

in teacher beliefs and practices, and student knowledge" (p. 306). The data were not separated by grade levels, so further scrutiny of the particular research studies dealing with elementary teachers and inquiry-based professional development was not possible.

Lee, Hart, Cuevas, and Enders (2004) investigated 53 third- and fourth-grade teachers at six elementary schools after the first year implementing inquiry-based science following professional development. The purpose was to describe teachers' beliefs and practices about inquiry-based science and the impact of the professional development in their practice. This qualitative and quantitative study acquired data from a variety of sources including focus group interviews, a questionnaire, and classroom observations. Although the results showed improvement in science knowledge of the teachers, inquiry-based practice was not always evident. There appeared to be a correlation between the depth of science knowledge and the comfort in using inquiry-based practice with their students. Further research is needed to clarify this correlation.

In a quantitative study, Young and Lee (2005) compared science student achievement of students whose teachers used science kits and those who did not. Teachers who had used the science kits had attended professional development training in the inquiry-based use of the kits. The science achievement of 226 fifth-graders using the kit-based science curriculum were compared with 173 fifth-graders that used non kit science materials. Students were given pre-and post-tests showing the students using kit-based science scored significantly higher than those who did not. This study offered support for using hands-on science as indicated by student achievement scores. It also

opened the door to further research concerning the relationship between the professional development and the use of hands-on science in the elementary classroom.

Akerson and Hanuscin (2007) conducted a case study of three elementary teachers (kindergarten, first grade, and sixth grade) involved in a three-year professional development program based on scientific inquiry, inquiry-based instruction and the nature of science concept. Data sources included; questionnaires, transcripts of video-tapes and field notes from the professional development and interviews, and teachers' lesson plans and description of changes in instructional approaches. The methodology utilized in this study served as an example of how one could use similar techniques to examine other professional development programs using inquiry-based strategies.

Summary of Constructivism, Investigative, Inquiry-based, Hands-on Teaching and Learning

Most teachers do not have experience with constructivist teaching and learning, inquiry-based, hands-on teaching even though the research suggests the benefits. Professional development experiences that modeled the use of this pedagogy offered that experience for teachers. The use of this type of engagement of learning for teachers is one of many components of effective professional development for teachers. It remains obvious that the majority of the research of constructivist science teaching and learning is based on middle school and secondary teachers and their students and quantitative studies. Of the few that include elementary teachers and their students, most often were in the upper grades, not primary elementary. A qualitative approach examining primary elementary teachers would provide rich description of how they implement that type of professional development in their elementary classrooms.

Effective Professional Development for Teachers

All professional development experiences are not created equal. Some are effective and others are a waste of time and resources. Kirkpatrick and Kirkpatrick (2006) offered a theoretical framework for evaluating professional development. Their four levels included: Evaluating Reaction, Evaluating Learning, Evaluating Behavior, and Evaluating Results (pp. 21-26).

In evaluating reaction, the participants' impressions of the professional development were crucial. If their experiences were not positive, it was almost assured implementation would not take place. The information collected and analyzed was valuable feedback for those who presented the professional development and may influence modifications in the future.

The second level of Kirkpatrick and Kirkpatrick's (2006) model of evaluation of professional development was evaluation of learning in which they stressed the importance of measuring learning that took place in professional development. The authors also emphasized the need for a method to determine what teachers had actually acquired during the professional development experience. This included the knowledge, the skills acquired, and change in attitude.

Evaluation of behavior was the third level of Kirkpatrick and Kirkpatrick's (2006) model. They examined behavior changes that teachers exhibited following the professional development. The authors found that surveys, observations, and interviews were excellent forms of data gathering that described the behavior changes teachers had undergone after the professional development experience. A multitude of factors

influenced the change in behavior. There were times when the change did not happen immediately following the professional development which made it more difficult to observe.

Evaluation of the results of the professional development experience was the fourth level in this model which focused on the final results. Kirkpatrick and Kirkpatrick (2006) presented these alternatives used to evaluate results: “use a control group, allow time for results to be achieved, measure both before and after the program, repeat the measure at appropriate times, consider cost versus benefits, and be satisfied with evidence if proof is not possible” (p. 65).

Guskey (2000) offered a similar theoretical framework for evaluating professional development in education. The five levels of his model were: participants’ reactions, participants’ learning, organization support and change, participants’ use of new knowledge and skills, and student learning outcomes (p. 79). The third level, which was an addition to Kirkpatrick and Kirkpatrick’s (2006), described organization support and change which could have a great impact on implementation by teachers. This support, or lack of it, from fellow teachers, administrators, and/or parents greatly impacted the implementation. The administrator in particular often dictated available resources as well as academic support for a new initiative. Components of these models were evident in the literature based on effective professional development for teachers.

All professional development for teachers in the state of Iowa must utilize the *Iowa Professional Development Model* (IPDM). This model was developed to give Iowa school districts guidelines about professional development experiences. All eii

professional development experiences take place in Iowa, so this model was used in development of the workshops. The IPDM (Iowa Department of Education, 2009, p.59) outlined characteristics of professional learning opportunities to guide quality professional development: one essential characteristic of this model was “new learning builds knowledge and skills around the identified instructional practice, and includes theory, demonstration, and practice.” Identified instructional practices described in the IPDM include the teachers’ engagement in learning during the professional development which aligns with the research mentioned previously in the section on constructivist teaching and learning. Another is the “learning is facilitated and planned” (p. 59). As described in the research of IEEIA, the professional development was planned around an instructional model that engaged the teachers in the learning. Those teachers used that model and engaged the students in their classrooms in the same manner. Additionally, IPDM depicted that “evaluation of professional development includes the study of teacher implementation and student responses” (p. 59). The IEEIA pre and post surveys of both teachers and students provided evidence of improved teacher and student achievement. Finally, the study of implementation of professional development was also a key aspect in the IPDM.

Professional development is an avenue to improve student learning by improving content knowledge and instructional practices of teachers. Effective professional development depended on factors described in the research. Desimone (2011) used the growing body of empirical research on professional development and outlined core features of quality professional development. Effective professional development

includes these five components: “content focus, active learning, coherence, duration, and collective participation” (p. 29). Desimone, Porter, Garet, Yoon, and Birman (2002) conducted a quantitative three-year study about the effects of professional development on teachers’ instruction. Desimone (2011) surveyed 207 elementary, middle, and high school teachers of mathematics and science in 30 schools from 10 school districts each year over a three-year period concerning their change in instructional practice following professional development. Findings showed that the professional development had an impact on change of instructional practices. Another major finding in this study was the importance of active learning for the teachers during professional development. Despite the fact that elementary teacher were included, the data from that group was not reported separately to allow for separate analysis.

In a literature review of math and science professional development, Kennedy (1999) examined 93 studies of effectiveness of professional development in math and science. Ten included evidence of student learning. Findings indicated that how students learned content was just as important as the content itself, however only four of the studies were programs aimed at improving student learning in science. Successful professional development programs focused on pedagogy as well as subject specific content. There was no breakdown of the studies into elementary, middle school, and high school teachers to discern if there was a difference for staff development implementation for those groups.

The role of the teacher’s mindset involved in the professional development experience was also an important facet of the learning. Along with content, teachers

learned instructional strategies to use with their students. Harlow's (2014) qualitative study identified how five fourth- and fifth-grade elementary school teachers from a single school district used ideas learned in a physics content course in their classrooms; the research questions were as follows: "1) What do the elementary school teachers transfer from the Physics and Everyday Thinking (PET) professional development course into their K-5 classrooms and, 2) What factors are involved in determining what is transferred" (p. 122). Data were collected in a variety of ways: interviews prior to the professional development concerning their science teaching practices, taping of the teachers during the professional development, and taping and interviewing following the professional development. Additionally, pre- and post- content exams and attitude surveys were administered and lesson plans and student work were collected. "Transfer was identified when the teachers used content or pedagogical ideas or practices learned in the physics course to help them solve problems in the context of teaching science to elementary school children" (p. 124).

The codes used in the analysis of the data of the teachers' responses to students' ideas that would indicate transfer of learning from the professional development were: no response, valuing students' ideas, direct instruction, and emergent instruction. Evidence of transfer was evident for three of the five teachers. Findings also showed the transfer of learning was dictated by what teachers initially felt were deficiencies in their science backgrounds. Few studies were located that mentioned how elementary teachers must adapt what they have learned in professional development to fit the needs of their students both before and during instruction. This was not the focus of the study, but it is

certainly an important aspect of elementary science instruction professional development that could be researched in more depth.

Motivation of the individual teacher was another important aspect in the degree of success of a professional development experience. Thomson and Kaufmann (2013) explored elementary teachers' motivations and expectations for engagement in science professional development using the Expectancy-Value theory which "explains that a person's motivation to engage in a behavior is the product of the individual's expectations to perform this task" (p. 46). Twenty first-through fifth-grade elementary teachers were involved in an in-depth semi-structured interview about their professional development experiences, their motivations for program involvement and their views of elementary science teaching. A content analysis technique was used to organize, code, and interpret the transcribed data. Data were coded in three ways; open, axial, and selective. Seven categories surfaced: teaching science strategies, obstacles to teaching science, expectations/roles of students, teacher self-efficacy, motivation to attend professional development, obstacles to attending professional development, and application of professional development into science classes. From those categories these themes emerged: beliefs, support, and relevance.

Their findings were similar to Harlow's in that the teachers' "self-efficacy beliefs about their science teaching" were critical in the increase in their learning in the professional development (p. 46). It was noted in the study that many times, the primary teachers felt the content was applicable to upper elementary teachers and their students, but not to younger students. Gathering more information from primary elementary

teachers and their reactions to another inquiry-based, constructivist, professional development in the current study provided an interesting comparison.

Summary of Effective Professional Development for Teachers

In conclusion, the research provided evidence that effective professional development hinged on a variety of factors: active and engaged learning, self-efficacy, content knowledge, pedagogy and connection to educational goals. Most studies were quantitative, although there were several qualitative studies of science professional development, but most still centered on upper elementary or middle school students and teachers. Many focused on specific professional development programs offering the possibility for comparisons to be made with studies of other professional development not previously researched. There are also qualities of behavior that surfaced in the research of professional development. Specific qualities of teacher behavior that impact teaching, learning and implementation of professional development instructional methods are the enthusiasm and empowerment of the teachers involved.

Teacher Enthusiasm and Empowerment

Another aspect in the realm of professional development to explore was the role of teacher enthusiasm and empowerment. Studies have been carried out that examined the effects of teacher enthusiasm on their students and how teachers were empowered through professional development experiences.

In a 2013 study, Breault focused on favorite and most effective teachers, one of the defining characteristics was teacher enthusiasm. In this qualitative study, 38 pre-service education students were interviewed and asked to describe their favorite and most

effective teachers. ”Although the responses yielded 35 different characteristics of effective teachers, three were dominant: their passion or enthusiasm for both teaching and the subject matter, their concern for the learning of all students, and their knowledge of subject matter” (p.1). A conclusion of Breault’s (2013) study was, “The notion of teacher passion or enthusiasm is especially important. Most comments related to the importance of a teacher who makes teaching seem like the most important job in the world” (p.7). Other studies described similar results.

In a 2000 study, Patrick, Hisley, and Kempler examined the effects of teacher enthusiasm on student motivation. Ninety-three college students completed a questionnaire about positive teacher behaviors. The students ranked 73 questions about positive teacher behaviors on a Likert Scale. “Among the teacher variables, teacher enthusiasm was the most powerful unique predictor of students’ intrinsic motivation and vitality” (p.217).

Keller, Goetz, Becker, Morger, and Hensley (2014) conducted a study of teacher enthusiasm and the relationship to students’ interest in the content subject. They found, “when students adopt the personal value exemplified by the enthusiastic teacher, situational interest can be transformed into individual interest” (p. 30). Survey data from 75 teachers and 863 students were used to determine the relationship between teacher enthusiasm and student interest and enthusiasm. “Enthusiastic teachers provide cues during the act of teaching that allow students to deduce the teacher’s personal value and enjoyment. Students consequently experience value and enjoyment themselves, reflective of elevated levels of interest” (p. 29). Another outcome of successful implementation of

professional development instructional skills, knowledge, and practices was empowerment of the teacher.

Overton (2009) conducted a qualitative study of eight early childhood teachers and investigated how change affected the teachers and focused on how they experienced empowerment. The teachers were interviewed and the data was analyzed and using a grounded theory approach which resulted in several categories describing the empowerment. One subcategory described how the teachers felt empowered through their own learning in the course of professional development. Teachers developed their own professional development goals and became more valuable staff members through this empowerment. The teachers were also empowered because they were allowed to make their own decisions in relation to professional development. Overton concluded that, "teachers who are contented in their teaching contexts—who have a sense of empowerment, whose workplace challenges do not overwhelm them—are more able to commit to the tasks of teaching with greater enthusiasm" (p. 7). This study described empowerment through: "the teachers' own learning through professional development, empowerment through decision-making, and empowerment through encouraging self and others" (p. 6). According to Merriam Webster (2015), empower means, "to enable, to promote the self-actualization of one's potential." The teachers in Overton's (2009) study were empowered by learning through professional development, making decisions about teaching and learning, and encouraging themselves and others.

Summary of Teacher Enthusiasm and Empowerment

The enthusiasm and empowerment of the teacher was supported by the research as important facets to support student learning. Students in the studies attributed their own interest and motivation to the enthusiasm of their teachers. These studies focused on secondary teachers and college professors. Two of the three studies were questionnaires, while the third involved interviewing pre-service educators. No studies were found describing the importance in student learning of the enthusiasm of elementary teachers.

Professional Development Interviews and Existing Data

This portion of the literature review defined the critical aspects of professional development and its implementation including the instructional model, interdisciplinary education, constructivist instruction, qualities of effective professional development for teachers, and teacher enthusiasm. Research clearly supported the type of teaching and learning that utilized these instructional methods. What is not clearly defined is description of exactly what happened in the classroom following the professional development experience. There was an abundance of research on the IEEIA model, but no published studies on the effectiveness of the related eii model. The eii team has gathered and analyzed pre and post data from both teachers and their students for use in grant applications and reports to granting agencies, but not for journal articles. Presentations included the pre and post data and describing the eii professional development model have been made at local, state, and national conferences. Many studies in the literature review examined professional development in middle and high school, but few in primary elementary grades.

In a 2014 mixed-methods study of the impact of professional development on instructional practices, Barlow, Frick, Barker, and Phelps (2014) used open-ended questioning and interviewing to "gain deep insight," of nine secondary teachers (p. 17). They documented the change of instructional practices following the training in modeling science instruction. The teachers were interviewed and those interviews were transcribed. Open coding and grounded theory were used to discover the factors affecting the implementation of the modeling of instruction. After coding, the researchers developed four themes based on the data: implemented modeling practices, aspects supporting the desire to implement, challenges to implementation, and perceptions of change in practice. The interviews provided insight about the teachers' perceptions of their implementation of the modeling of science instruction that could be explored through coding and analyzed for grounded theory development.

Eargle (2013) also searched for common themes in interview data. Eargle utilized semi-structured questions when he interviewed six high school social studies teachers following professional development and partnership with a nearby university. Field notes were taken during the interviews and were later transcribed and coded. A common theme emerged from the analysis following the professional development, these teachers fulfilled the role of teacher-leaders in their respective schools.

Masuda, Ebersole, and Barrett (2013) use interviewing techniques with 16 teachers at different career stages to determine their attitudes and feelings about professional development experiences; the researchers stated their reason for using qualitative interviewing was to capture the attitudes and feelings of the teachers and

describe the findings in their own words. Ireland, Watters, Brownlee, and Lupton (2012) conducted semi-structured interviews with 20 elementary teachers concerning their understanding of inquiry-based learning. The interviews were analyzed and the data resulted in three categories: student centered experiences, teacher generated problems, and student generated questions. The results of this study were used to mold professional development of inquiry-based learning based on what teachers already knew and what they needed to learn.

Summary of Professional Development Interviews and Existing Data

The use of interviewing teacher participants from professional development experiences appeared to be common according to the prior research studies. Many used that type of data to analyze and develop categories, themes, and to develop conclusions from the data. Interviewing elementary teachers about their experiences in professional development was not as prevalent as studies with middle school and high school teachers.

CHAPTER 3

METHODOLOGY

Research Methodology and Rationale

I employed qualitative methodology to analyze the existing data gathered from 15 elementary teacher participants following an eii professional development experience and the implementation of the eii model in their elementary classrooms. I chose qualitative research methodology to allow for rich description of the instructional methods, activities, and lessons the elementary teachers chose to use and the modifications they made in their classrooms. Braun and Clark (2013) described the advantages of qualitative research when "trying to understand people's meanings" (p. 24). They elaborated by explaining that it allows a "far richer or deeper understanding of a phenomenon" (p. 24) through the focus of the participants' terms of reference rather than the researcher. In this study, teachers shared their own frame of reference of implementation of the eii instructional model. I gathered data in several ways: group and individual interviews, unit and lesson plans developed by the participating teachers and co-teaching journals I kept when co-teaching with two elementary teachers in their respective classrooms using the eii instructional model. I chose interviewing to allow the teacher participants to put the experience in their own words. Horvat (2013) explains the value of interviewing. "Good interviews can describe in detail a process or instance that has meaning" (p. 71).

I used triangulation of information to strengthen this study by including data from a variety of sources as described by Braun and Clark (2013).

> In research, triangulation traditionally refers to a process whereby two or more methods of data collection or sources of data are used to examine the same phenomenon, with the aim of getting as close to the truth of the object of study as possible (p. 285).

In this study, information was generated from two separate interviews with each teacher participant, the unit lesson plans developed by the teachers, and the journal notes I kept while co-teaching with two of the participants in their elementary classrooms.

IRB Approval

As a doctoral student, I obtained Institutional Research Board (IRB) approval from the University of Northern Iowa in January of 2013 for the purpose of gathering data about this type of professional development implementation for future publication purposes. The teachers received an email a month prior to the update sessions explaining the opportunity to participate in the data collection (see Appendix B). At the four update sessions: April, 5-6, 2013, April 26-27, 2013, April 4-5, 2014, and April 25-26, 2014, another member of the eii instructional team explained the IRB consent form to the teachers and invited them to sign to indicate whether or not they wished to participate in the study. The team member placed the forms in a sealed envelope that was not provided to me until teachers' grades for the workshop had been submitted. This granted the teachers anonymity in their decision about whether or not to participate and enabled me to use their responses in the study. I analyzed this pre-existing data from the teacher interviews, lesson and unit plans shared at the update sessions, and co-teaching journals for this research. The IRB was renewed in January, 2014 and January, 2015.

Data Sources

One source of data was face-to-face interviews with the teachers on two separate occasions when they were asked to explain and describe their implementation based on the four levels of the eii instructional model. The first interview occurred at the update session and was a group sharing of what the elementary teachers had done with the thematic unit in their own classrooms from the initial professional development session a few months earlier. After the IRB forms were signed, I joined the teachers for the sharing session. As the director of the eii program and leader of the workshops, the teacher participants and I had a prior professional relationship. As the contact person for the registration and support system via email and phone messages, the teacher participants were familiar with my role and were comfortable with the sharing of their experiences in the classroom. I made few comments during the interviews, answered questions when asked, and did not make judgmental remarks concerning the implementation.

I conducted an additional interview with only the teachers that had signed the consent form. These interviews took place after the academic year had concluded and participating teachers had received grades and graduate credit for the course. I did not open the sealed envelope containing the IRB permission forms until those final grades were submitted. After submission of the grades, I contacted the teachers interested in sharing how they implemented the eii instructional model in their classrooms and scheduled interviews. This second face-to-face interview was an individual interview held at a time and place convenient to the teacher, most often in his or her own classroom, and lasted approximately one hour. Kutner, Sherman, Tibbetts and Condelli

(1997) described the use of the interview process to evaluate professional development as, “particularly valuable in obtaining reports of changes in behavior” (p. 25). The four levels of the eii instructional model were the framework for the interviews. Teachers were able to put the experience in their own words as I conducted the individual interviews. By this time, the teachers and I knew each other quite well, and they very comfortable telling their stories of implementation of the eii instructional model. Again, I made few comments, especially not judgmental evaluations about the implementation, and only asked questions that would allow the teacher to elaborate on what happened in the classroom. The majority of the interviews took place in the classrooms, where frequently, the teachers had projects, posters, and other related items visible on their walls and displayed to which they pointed out or referred to during the discussion.

The second type of existing data analyzed included the unit and lesson plans written by teachers in which they explained what activities they chose to use in the implementation of the unit in their classrooms. In the initial workshop session, teachers were actively engaged in learning the four levels of the eii instructional model described in Table 3.

Table 3

Eii Instructional Model

Eii Instructional Model	**Instructional Content in the Initial Workshop Sessions**
Level I: What is an environmental issue?	Motivator Discussion Analysis of *The Lorax* What is the difference between an environmental problem and an issue?
Level II: What are the ecological concepts necessary to understand this issue?	What is a prairie? What wildlife species are found in the prairie? What habitats are in the prairie? What are the properties of water? How much water do we have? How much water do we use? How much water do others in the world use? How can water be filtered?
Level III: What are local issues related to this topic?	Environmental issues are analyzed in the same way *The Lorax* was in Level I. What should be done about the high population of deer in Iowa? Should highways be built through or around wetlands? What should be done to enhance water quality in Iowa? Whose responsibility is it to enhance water quality in Iowa?
Level IV: What responsible environmental action can be taken?	Examples of responsible environmental action are given in the initial workshop, but stressed that each class should come up with their own plan of responsible environmental action that fits their school and community, but related to the environmental topic.

The participating teachers were directed to organize their unit plans using the four levels as evidence of their understanding of the model. The teachers included under each

appropriate level the lessons and activities experienced by their students and the successes and challenges they faced in teaching the unit. This data described the choices teachers made in teaching the unit in their respective classrooms. Although they were expected to follow the four levels of the eii instructional model, they were free to choose exactly which lessons and activities to use with their own students. The teachers used the unit lesson plans during the first interview at the update session as a reference for what they had implemented in their own classrooms. I first read the unit lesson plans as assessment for the teachers' grades. The next reading was just prior to the individual interview session to refresh my mind as to what that particular teacher had done with the eii unit with students. During the individual interview sessions, teachers often referred to the lesson plans during the discussion.

I examined the lesson plans to determine the understanding of the four levels of the eii model in their implementation in the classrooms. The lesson plans also served as a cross-check with the interviews of the teachers. The lesson plans were coded keeping in mind the previous coding done with the interview data. I was looking for information that had not been included in the interviews, but was found in the unit lesson plans and highlighted those sections. The data were coded and categories were developed to explain additional information about the implementation of the eii instructional model in the elementary classrooms.

The third source of data was the co-teaching journals I wrote when co-teaching with two elementary teachers in their respective classrooms. Both were fourth grade teachers in separate school districts. The first co-teaching took place in the spring of

2013. I spent 10 one-hour sessions with the cooperating teacher and 24 fourth graders experiencing the eii unit, *Wildlife of Prairie Roadsides.* The second took place in the spring of 2014.I spent eight full days co-teaching with the 4th grade teacher and 24 students experiencing the eii unit, *Preserving and Protecting Our Water Resources*. The planning and execution of the environmental issues units was a collaborative effort by the teachers and myself. Planning and preparation of the materials and the instruction were both a cooperative effort, although I prepared many of the booklets and brought materials for the activities. The co-teaching experience gave me great insight to the implementation of the eii instructional model in elementary classrooms. Information from those teachers was included in the two interview sessions so their personal perspectives are reflected in the interview data. My perspective of the implementation was revealed in the reflective daily journals I kept.

Purpose of the Research

The researcher:

1. examined how 15 elementary teachers implemented each level of the environmental issues instruction (eii) model in their classrooms.
2. identified the successful and challenging components of the implementation.
3. searched for common themes in the responses.

Research Questions

The research questions were:

1. How did elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?
2. Why did elementary teachers modify lessons and activities when implementing the environmental issues unit in their classrooms?
3. What effect did the eii professional development experience have on the participating teachers?

Eii Teacher Participants

In the 2012-2013 academic year, 44 teachers attended the *Wildlife of Prairie Roadsides* workshops held in Mt. Vernon, Iowa and Pleasant Hill, Iowa. In the 2013-2014 academic year, 44 teachers attended the *Preserving and Protecting Our Water Resources* workshops also held in Mt. Vernon, Iowa and Pleasant Hill, Iowa. Both of the environmental issue topics were based on the eii instructional model and followed the four levels of environmental issues instruction. The environmental issue topics change each academic year, but follow the same format for instruction and implementation. Attending the workshop initially was voluntary. Brochures, post cards, and emails were sent to teachers of all grade levels and content areas throughout Iowa inviting attendance at this professional development opportunity. Teachers registered for the workshop voluntarily and paid a $198 fee. They received food, lodging, materials, and two graduate credits from Upper Iowa University for their participation. Grant funding from the Iowa

Department of Natural Resources' Resource Enhancement and Protection Conservation Education Program (REAP-CEP) and the Iowa Department of Transportation's Living Roadway Trust Fund (LRTF) supported the workshops.

Eighty-eight kindergarten through twelfth grade teachers attended the two professional development workshops. Only elementary teachers were invited for inclusion in the study. Approximately 25 elementary teachers in two separate eii professional development workshops were given the opportunity to participate in the gathering of data. Thirty days prior to the update session, I sent an email to them explaining the research project and their opportunity to participate (see Appendix B). At the update session, another instructional team member gave them a copy of the IRB Consent Form to read and invited them to sign indicating their participation (see Appendix C). Fifteen elementary teachers agreed to participate in the study. Grade levels of the teachers included in the study ranged from Kindergarten to 4th grade including both grade level teachers and those who worked with talented and gifted students.

Steps in Gathering the Research Data

1. Teacher participants attended eii workshops

Wildlife of Prairie Roadsides

November 2-4, 2012, Pleasant Hill

February 15-17, 2013, Mt. Vernon

Preserving and Protecting Our Water Resources

November 8-10, 2013, Pleasant Hill

February 21-23, 2014 Mt. Vernon

2. Teachers implemented eii unit in classrooms
3. Teachers attended the eii update sessions

Wildlife of Prairie Roadsides

April 5-6, 2013, Pleasant Hill

April 26-27, 2013, Mt. Vernon

Preserving and Protecting Our Water Resources

April 4-5, 2014, Pleasant Hill

April 25-26, 2014 Mt. Vernon

4. Elementary teachers were invited to participate in the study
5. Teachers shared implementation in grade-level groups based on the four levels of the eii model (only responses of participating teachers were used in this study)
6. Elementary session was audio-recorded
7. Teachers submitted unit and lesson plans based on the four levels of the eii instructional model (only lesson plans of participating teachers were used in this study)
8. Individual teacher participants were interviewed and audio-recorded
9. I co-taught with two elementary teachers and kept journals

Coding and Analyzing the Data

I used thematic analysis as the qualitative methodology in the analysis of this pre-existing data. Braun and Clark (2013) describe thematic analysis as, “a method for identifying themes and patterns of meaning across a dataset in relation to research

questions" (p.175). Braun and Clark further explain that, "a subcategory of thematic analysis is theoretical thematic analysis, guided by an existing theory and theoretical concepts as well as by the researcher's standpoint, disciplinary knowledge and epistemology" (p. 175). The existing theory used in this study was the eii instructional model by which the archival data was organized and presented in the interviews, unit lesson plans and co-teaching journals. My 25 years of experience with the instructional model describes and supports the "researcher's standpoint, disciplinary knowledge, and epistemology" according to Braun and Clarke (p. 175). I coded the interview and co-teaching journal data using complete coding, described by Braun and Clark by "identifying anything and everything of interest or relevance to answer the research questions" (p. 206). I coded the unit lesson plans using selective coding, described by Braun and Clark by "developing an inclusive corpus of items of interest across the entire data set" (p.202). Selective coding was used in the unit lesson plans to search for items not already coded in the interview data. I analyzed the data using constant comparisons. Corbin and Strauss explain "in doing constant comparisons, data are broken down into manageable pieces with each piece compared for similarities and differences" (p. 11). Although this type of analysis is most often identified as a key feature of grounded theory Braun and Clark explained, "an approach like this is essential for rigorous qualitative analysis in general" (p. 214). This process involved constantly comparing data segments with other segments of the data to derive meaning. During this process, I searched for categories into which the data could be coded. Themes were established from the

categories and finally, an overarching theme was generated from the analysis of the data. I began analysis by studying the transcripts of the interview sessions, next, the unit lesson plans, and finally, the co-teaching journals.

Data Analysis Steps for Interview Data

1. Interviews transcribed verbatim
2. Read and reread the interview transcripts, noted items of interest, developed codes
3. Coded the interview data set using the complete coding method
4. Described the categories
5. Developed subcategories
6. Developed spreadsheets for data
6. Added or eliminated categories
7. Rank ordered the categories
8. Developed tables of categories by rank order and eii instructional levels
9. Wrote text using data from tables

Data Analysis Steps for Unit Lesson Plan Data

1. Read and reread the unit lesson plans
2. Coded the unit lesson plans using the selective coding method searching for data not in interviews
3. Developed and described the categories
4. Developed subcategories
5. Created table to describe categories

6. Created table to show use of content standards in lesson plans
7. Wrote text using data from tables

Data Analysis Steps for Co-Teaching Journal Data

1. Read and reread the co-teaching journals
2. Coded the co-teaching journals using the complete coding method
3. Developed and described the categories (See Table 4)
4. Created table of coded categories
5. Wrote text using data from tables

Developing Themes Following Data Analysis

1. Searched for themes
2. Defined and named themes
3. Developed overarching theme
4. Prepared a model for the themes and the overarching theme
5. Prepared model of empowerment aligned with eii model

Table 4

Data Analysis Definitions

Coding the Data	Coding the data involves assigning descriptive labels for the categories. Eg: SE stands for Student Engagement
Developing Categories	Categories are the groups of data that are similar and assigned codes. Eg: Student Engagement
Complete Coding	Anything and everything of interest or relevance to the research questions are coded.
Selective Coding	Identifying specific instances of phenomenon and coding those.
Description of Categories	Description of how data was included in a particular category.
Development of Themes	Themes are developed after data analysis aligned with the research questions. The themes are generalizations derived from the data analysis.
Development of an Overarching Theme	An overarching theme is an encapsulation of all the themes derived from the analysis of the data.

The interviews were transcribed verbatim with the speaker and identifying information included. Pseudonyms were used in the dissertation to mask the true identities of the participants. The co-teaching journals were also coded using the same method and codes as the interviews. I developed the categories and the associated codes while examining the transcripts and the journals.

Next, I examined the interview transcripts and decided which categories seemed to fit and color-code the text to match the code assigned to that category. Each participant's transcript was considered individually adding any new codes that surfaced in the findings. After the codes were written in the margins of the transcripts, I added notes in the margins that provided explanations for unclear concepts presented in the narrative (see Appendix D). I read through the manuscripts several times and made decisions about the categories. Occasionally, I changed codes and categories as new understandings surfaced.

After all transcripts were coded, and notes were added, I created a spreadsheet for each of the four levels of the eii instructional model. The spreadsheet was set up to put the coded data into a form to be analyzed. I identified each teacher with a pseudonym on the left-hand side. I listed the codes and color-coded along the top indicating the category of the data. I entered the line number from the original transcript as well as the accompanying text for that coded category. I entered data from all transcripts into the four spreadsheets (see Appendix E).

The next step was ranking the order of the categories of the interview data. I counted each coded column and entered the total number of responses at the bottom.

After I quantified all categories, I created another spreadsheet to show the number of responses for each category in order from the most to least. After developing the rank order of the categories, I wrote a summary description of each coded category in the coding data sheet. This allowed me to briefly explain the content of the information found in each category.

The next analysis I conducted was the unit lesson plans. I used selective coding and examined the data for information that was not mentioned in the interview data. The categories I created were modifications, additional resources, understanding of the four levels of the eii instructional model, and grade level content standards. The unit lesson plans were in printed form, not electronic, so I highlighted the new data and wrote the codes for the categories of modifications and additional resources in the margins of the lesson plans. I created subcategories for those two categories. I also looked for evidence of the understanding of the eii instructional model. I read each lesson plan and checked for appropriated lessons and activities listed under the proper level of the instructional model. Additionally, the lesson plans included the alignment with the standards for their grade level. I created another table to show the content areas teachers used in the implementation of this unit.

The co-teaching with two fourth grade teachers provided great insight to me about the implementation of the eii model in elementary classrooms. Putting those thoughts down on paper through the co-teaching experience provided a contextual background for the analysis of the interviews with other teachers. I coded the journals with many of the same coded categories and created a table to show that data (see Table 11).

Using all the data, I searched for common themes and trends using the theoretical thematic analysis approach to qualitative research. According to Braun and Clark (2013), "the aim is to generate an analysis from the data" (p. 175). Braun and Clark described the analysis as shaped by the "researcher's standpoint and disciplinary knowledge" (p.173). In this case, I had many years of experience with this instructional model, but had not previously gathered and analyzed data from the teacher participants in this manner. I used the four levels of the eii model as a structure for analysis and coded the results accordingly. I searched for an understanding of what lessons and activities were chosen during the implementation. Another factor I examined was why the elementary teachers made modifications to lessons, activities and instructional strategies learned in the initial workshops. The unit lessons plans were used to clarify any questions the researcher had about activities and lessons the teachers talked about in the interviews. A third factor described what effect the professional development experience and the implementation had on the participating teachers. I described in detail the analysis of the interview data in Chapter 4A, while the analysis of the unit lesson plans and co-teaching journals were described in Chapter 4B. Finally, in Chapter 4B, I developed a table showing connection between the categories of Teacher Enthusiasm and Interdisciplinary Teaching and Learning.

CHAPTER 4A

DATA ANALYSIS OF THE INTERVIEW DATA

Introduction to the Data Analysis

In this study I investigated the implementation of the Environmental Issues Instruction (eii) model by elementary teachers after attending the professional development experience. The purpose of this chapter was to present the data collected from 15 elementary teacher participants through group and individual interviews, their unit lesson plans, and the co-teaching journals.

Research Questions

1. How did elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?
2. Why did elementary teachers modify lessons and activities when implementing the environmental issues unit in their classrooms?
3. What effect did the eii professional development experience have on the participating teachers?

Coding the Interview Data

I developed appropriate categories during the process of coding the interviews. An initial coding scheme was developed, as shown in Table 5, but modifications, additions, and deletions occurred during the coding process, as shown in Table 6.

Table 5

Original Interview Data Coding Key

Category Code	Category Title	Category Description
AS	Administrative Support	The teacher described either support or lack of support from school administration.
CC	Curriculum Connection/Standards	The teacher described connections with school district curriculum and content standards.
CH	Challenge	The teacher described an aspect of the implementation that was challenging.
HO	Hands-On	The teacher described lessons in which the students were actively engaged in the learning.
ID	Interdisciplinary Teaching and Learning	The teacher refers to integration of two or more content areas.
IM	Instructional Model	The teacher refers to the eii instructional model.
MC	Modeled in eii workshop	The teacher makes reference to activities or lessons experienced in the eii workshop.
MOD	Modification	The teacher described a modification made to a lesson of activity from the eii workshop.
OE	Outside Experts	The teacher described the utilization of outside experts during the implementation.
OC	Outside of the classroom	The teacher described taking the students outside the classroom.
PD	Professional Development	The teacher referred to the professional development experience.
SC	Student-Centered	The teacher referred to learning that is student-centered, not teacher-centered.
SE	Student Engagement	The teacher described the students being actively involved and engaged during the learning.
SX	Success	The teacher described a specific aspect of the implementation that was successful
TM	Time	The teacher referred to time in connection with the teaching of the unit.

Final Interview Data Coding Key

After examining the interview data numerous times, I developed the final coding scheme and all data were coded using the following scheme. Even during the final stages of the analysis some categories were combined as noted. Final categories were

determined as well as subcategories to organize the data. They are listed in the rank order from most to least of the number of times coded in the data.

Table 6

Final Interview Data Coding Key

Category Code	Category Title	Subcategories	Category Description
SE	Student Engagement	Hands-on Understanding Concepts Student Choice Environmental Action Projects Enjoyment Relevance	The teacher described the students being actively involved and engaged during the learning.
WA	Workshop Activity	*The Lorax* Incredible Journey Water Properties True/False Booklet Where Does Your Sidewalk End? Graphing Prairie Roots	The teacher made reference to an activity experienced in the eii workshop.
TE	Teacher Enthusiasm	Impacts on Students Impacts on Others Helping Students Make Connections Instructional Strategies	Enthusiasm exhibited by the teacher when describing lessons.
MOD	Modification	Student Ability Time Understand and Learn Concepts	The teacher described a modification made to a lesson of activity from the eii workshop.
CC	Curriculum Connection/Standards	Alignment with Standards Involvement with Other Teachers Local Curriculum Connections Interdisciplinary Teaching and Learning	The teacher described connections with school district curriculum and content standards.
CH	Challenge	Time Cognitive Abilities of Students Availability of Students Limited Resources Help in the Classroom	The teacher described an aspect of the implementation that was challenging.

Table Continues

OR	Other Resources	Print Resources Human Resources Electronic Resources	The teachers described other resources they found that correlated with the eii unit.
UF	Use in the Future	Plan to Use Do not Plan to Use	The teachers mentioned activities they would or would not use in the future.
EX	Experts	College Professor Naturalist Local Farmers AEA Constultant IOWATER Trees Forever	The teachers referred to experts that spoke to their class.
OC	Outside the Classroom	Near the Classroom Field Trips	The teachers mentioned when they took their students outside the classroom
LCC	Local Community Connection	Connecting with Our Town Nearby Bodies of Water Flooding Iowa Critters Connections with Action Projects	The teachers made reference to connections they made to their local community.
SP	Support	Administrative Support Support from Others	The teacher referred to support in teaching the eii unit.

Analysis of Interview Data by Rank Order of the Categories

My first analysis of the interview data consisted of looking at the number of times the following categories were mentioned in the coded data. I described the data in that rank order. Table 7 shows the final categories, their rank order, and the number of instances mentioned in the interview coding.

Table 7

Rank Order of Interview Coded Categories

Rank Order	Categories	Instances
1	Student Engagement	235
2	Workshop Activities	115
3	Teacher Enthusiasm/Success	94
4	Modification	90
5	Curr. Conn	70
6	Challenges/Time	57
7	Other Resources	37
8	Future Use	27
9	Experts	27
10	Outside the Classroom	22
11	Local Community Connections	21
12	Support	16

Student Engagement

The category mentioned most often by all of the 15 participating teachers and coded 235 times was student engagement during the implementation of the eii unit. Initially, this category included only **hands-on, constructivism, and inquiry-based learning**. As the data were examined, other types of student engagement emerged, such as **comprehension of concepts, student choice in learning, environmental action projects, enjoyment in learning, and relevance of the learning to students.** As most of the activities mentioned included more than one of the aspects of student engagement, they are noted in bold face type in the description of the implementation of specific activities. The teachers provided many examples of student engagement in the learning.

The water cycle. Student engagement in the **hands-on** role-playing game entitled, *The Incredible Journey*, in which the students traveled through the water cycle as a water droplet, was described by the teachers as they related comments their students had made:

- "Everybody in the class was stuck in the ocean."
- "Wait, a minute, I'm stuck here again!"
- "But, I'm stuck in the glacier again!"
- "How come I never get to the animal station?"
- "I have never been to the plants."

The teachers' comments denoted that through the students' engagement in this activity, they really **understood and comprehended the concept** of the water cycle. "That game brought home the water cycle." "I felt like they understood the water cycle." "Second graders could grasp the water cycle." "They understood that the water cycle is happening everywhere." The teachers felt that through this activity, the students **learned and understood** the water cycle at a deeper level. Student engagement was illustrated in this unit in other means as well.

Vocabulary. Another example of **student engagement** in the eii unit was learning the essential vocabulary including the students' **enjoyment of the learning** in the process, and their use of the terms throughout the unit as well as in their speaking vocabulary. All the terms along with their definitions were posted throughout the classroom on the walls in no particular order. The students each had note cards on a metal ring that only had the vocabulary terms written on them. Their job was to find the definition and add it to the card on their ring. This took a rather mundane activity of

learning vocabulary and turned it into an **engaging** and **enjoyable activity** for the students as expressed by Richard, “I heard a student say, ‘This is so much fun! We’re just kind of running around and you know what—we’re learning something!’” **Students** were not given a specific path to follow, they could **choose** how to complete the search for the vocabulary definitions. Richard described how students approached the activity in different ways. “Some moved very methodically around the room, and then there were some zoomers (sic) who went all over the place.” Aside from the fact that the **students enjoyed** the vocabulary activity, the teachers also expressed how pleased they were that the students **used the vocabulary** terms throughout their studies in the unit and beyond. According to Marilyn, “They picked up the terms really fast and really well and they used them in conversation.” Rhonda also was impressed with her students’ use of the terms. “It was so cool to hear them use the vocabulary.” Alyson commented, “They referred back to them and wanted to keep them (the rings of cards) at the end of the year.” Other hands-on activities also illustrated student engagement in the eii unit.

Hands-on water properties activities. There were several activities in the eii unit that were designed to help students understand the properties of water. One of those was predicting and demonstrating how many drops of water can be placed on a penny before it overflows showing cohesion of water droplets. Alyson described the **engagement** of her students in the process. “The kids were carefully putting drop after drop on their pennies, writing in their journals, sketching their pennies, **they *saw* cohesion**, the concept of cohesion.” “They were talking and making predictions.” Rhonda mentioned the **mounting excitement** as the activity ensued, “They were all around there counting and

getting louder and louder." They were not only **engaged**, but **understood the concepts**." This was evident in other activities as well.

Water filtration. Another **hands-on** endeavor in the eii unit was designing and building water filtration devices. This incorporated the engineering aspect of science as well as the concept of cleaning polluted water through filtering. Rhonda described the students working together to design, build, and test their filtering devices. "They met in their groups and **decided** who was going to do what. They **described** in their journals exactly how their filters would be built." At the end, she described the outcome. "They **could see** the water getting cleaner." They **actually experienced** how water could be filtered in an **engaging, hands-on** manner.

Workshop Activities

The category that ranked second in the coding and mentioned 115 times by teachers during the interviews was workshop activities. The teachers experienced many activities during the eii professional development workshop. They were not expected to do all of these activities with their students. They were free to choose what they felt was appropriate for their grade levels and content areas to teach and learn about the environmental issues' content, but were still expected to adhere to the four levels of the instructional model. As the teachers were interviewed, it was apparent which activities were most prevalent in the teaching of the unit. More importantly, information was gathered about the teachers' perceived value of those activities and how the activities helped students comprehend the concepts in the unit.

An essential component of the eii workshop was that the teachers actually experienced the activities and lessons they used with their own students. They were actively engaged in the learning throughout the eii workshops just as their own students were.

The Lorax. The eii professional development workshops began with the use of *The Lorax* by Dr. Seuss (1971) and introduced the thematic issues unit by demonstrating the difference between environmental problems and issues. Understanding the difference between a problem and an issue was a fundamental concept essential in the successful implementation of the eii instructional model. During the eii professional development, the teachers participated in a choral reading of the tale with all actively participating in the story using props. After the dramatization, an issue analysis web was used to describe the characters, their motivations, their points of view, and stating the environmental problem and environmental issue. In addition to the analysis of the story, other activities associated with the study of *The Lorax* included; *The Lorax* booklet, a motivator booklet, and *Lifted Lorax* statements. In *The Lorax* booklet, the story was reviewed using story elements such as main characters, setting, plot, and culminating with describing the problem and issue found in the story. In the motivator booklet, terms that describe what motivates people are pictured. While specific terms were provided, students and teachers were encouraged to provide words for the motivator pictures that are meaningful to them. The specific motivator terms are: aesthetic, cultural, ecological, economic, educational, egocentric, ethical/moral, ethnocentric, health, political, recreational, religious, and

social. The *Lifted Lorax* statements are taken from the book and students were asked which motivator terms applied to that statement.

While all 15 teacher participants used *The Lorax* and accompanying materials to some degree in their classrooms, everyone did not use all of the components. In their interviews, most merely mentioned *The Lorax* activities they incorporated into their teaching, and did not elaborate as much as in other categories. Rhonda mentioned she liked the use of the Frayer Model, in which the students defined the motivator term, drew a picture of it, and gave an example and a non-example. Roy mentioned that his students loved doing the motivator booklets. While each workshop starts the same way with *The Lorax*, the activities that take place after that vary according to the theme. In this study, teachers from two separate workshop themes were included, so the activities they used varied. There were five teachers from *Wildlife of Prairie Roadsides* and 10 teachers from *Preserving and Protecting Our Water Resources*.

The incredible journey water cycle game. As described previously, this was a popular activity for the teachers that taught the *Preserving and Protecting Our Water Resources* thematic unit as all teachers reported incorporating this activity into their unit study.

Properties of water activities. Studying the properties of water in the *Preserving and Protecting Our Water Resources* was also prevalent in the units taught by those teachers. Nine of the 10 teachers utilized the water properties activities in some way. The tenth teacher, Jason, said his students had studied water properties earlier in the year.

True/false booklets. The teachers that attended and implemented the *Wildlife of Prairie Roadsides* thematic unit noted the True/False booklets as the most commonly used activity. All five teachers had their students create the true/false booklets. The students each chose or were assigned an animal that would be found in an Iowa prairie habitat. Using an instructional technique called copy/change, the students read titles from published literature and created their own booklets using the same format. The Scholastic Company publishes a series of books using a true/false format. A statement is made on one page that is either true or false and when the page is turned, either true or false is indicated and explanatory information is also given. The students used that format to create true/false booklets about prairie animals from Iowa. Roy explained how the students researched for information and constructed their booklets. “I took them to the library to find books that had information about their animals.” He also mentioned the importance of allowing them enough time to finish. “For them to do quality work, you have to allow them enough time to complete the booklet. They took their time and were very proud of their booklets.” After the booklets were completed the students really enjoyed sharing them with others. Michelle commented, “They were so excited, they were trying to hide the answers so others could not cheat.”

Where does your sidewalk end? Another activity in the *Wildlife of Prairie Roadsides* theme that was popular, as all five teachers reported using it, was entitled, *Where Does Your Sidewalk End?* To introduce the students to the concept of what was beyond the end of the sidewalk, they read the poem, *Where the Sidewalk Ends*, by Shel Silverstein (2014). Following that, they drew what was beyond their own sidewalk. They

made a list of the biotic and abiotic items they had drawn. Richard remarked, “I was very surprised that most students drew from a very urban perspective, and did not view the area beyond the sidewalk as forested or prairie-like. It was obvious they did not know much about prairie wildlife. It served as a good pre assessment of their prior knowledge.”

Nancy described in her lesson plan how she took her students outside to draw renditions of where their sidewalks ended. On a beautiful spring day, they used sidewalk chalk and drew their ideas right on the sidewalk.

Graphing prairie roots. Four of the five teachers of the *Wildlife of Prairie Roadsides’* group did a root graphing activity in which they read about prairie roots in a variety of sources. Next, using jute string, the students created models of prairie plant roots the exact length as depicted on the roots posters. Alyson indicated the impact of this activity on the students. “They were amazed at the actual length of the roots of prairie plants, especially after seeing the comparison of lawn grass on the roots posters.”

Teacher Enthusiasm

The third category in the ranking was Teacher Enthusiasm. There were 94 instances of expressions of teacher enthusiasm as the participants described their implementation of the eii thematic unit in their classrooms. The teachers were quite pleased with what they had done in their classrooms with the eii unit. This category was first entitled, *Teacher Excitement*, but a review of the literature revealed it was commonly referred to as *Teacher Enthusiasm*. The research literature supports the importance of teachers’ enthusiasm as it relates to students’ interest and academic achievement. Teacher enthusiasm was exhibited in a variety of ways including; impact on students, impact on

others, using new instructional strategies, and helping students make connections. Late in the analysis process, the success category was incorporated with the teacher enthusiasm category as it really did not seem like a unique category.

Impact on students. Marilyn talked about the use of the book, *One Well* (Strauss & Woods, 2007) with her students in discussing water issues. This book gave information about water usage throughout the world and specific examples of how much water is needed to manufacture certain items such as a pair of blue jeans. She explained how interested and amazed the students were as they read it together. “It was really interesting to see them, to see the little gears turning in their heads about water usage.”

As a part of Level IV of the eii model, *Responsible Environmental Action*, Ashley’s students designed and placed signs in the prairie located behind their school showcasing the animals that were found in that habitat. She expressed her thoughts in this way. “They have a sense of ownership with those signs, they were so excited when they saw people actually reading the signs. They were involved in the design process and wrote thank you notes to those in the community that contributed to make the project become reality.” She spoke about the effect of this project on her students and the role of the teacher: “We as teachers have to be more along for the ride rather than trying to direct traffic.”

Impact on others. Beverly spoke about the influence the unit had on others besides her own students: “We didn’t just influence the kids at this school, we influenced all of their parents and their siblings.” She was referring to her students relaying what they were doing at home to use less water through their studies in the eii unit.

Helping students make connections. Ashley passionately explained how she helped her students make connections in the study of the water unit. Many of her students had experienced flooding in the past few years, so the water study really hit home for them. Actually during the study, their area experienced yet another flood. Some students explained that they had not finished fixing up their homes since the last flood. Ashley expanded the unit to help them learn more about flooding and why it happens: “We watched videos on flooding because it was such a big thing in our area.” She gathered books about flooding and found websites to help them learn more about a problem that was very real to them: “They were able to make great connections to what we were learning about water and their own lives.”

Amanda expressed enthusiasm about the connections her students made when they were analyzing real environmental issue readings in the eii model Level III, *What are the local environmental issues? Riparia’s River* (Caduto, 2011)
is a fictional story of pollution in a stream as a result of farming practices. The articles are from recent publications describing examples of stream pollution in the state of Iowa. “The connections they made between *Riparia’s River* and what was going on in the articles, I thought was golden.” The students made tables in their notebooks and wrote down the similarities and differences as well as the problems and issues in each of the readings about water pollution. The students were able to discover the connections in those readings and apply them to their study of local water issues.

Gail shared how her students discussed the water shortage in California during the Level III issues discussion. She explained that it really helped her students see

connections in the real world and their study of water. “That’s a huge part of the impact and it was neat how it went right along with the lessons, and it was on the news. You can bring real life into the lessons.”

Jason mentioned several activities that helped his students make connections to the learning about water. He felt taking his students out to a creek to do water testing helped in their understanding of water concepts: “Definitely going out and testing the water with the kids was awesome.” Two other activities were “making predictions for the water solubility, and creating their own water cycle charts.”

Instructional strategies. Several teachers mentioned in the interviews that through the implementation of this unit, they tried new instructional strategies that were successful. Rhonda discussed how her students made the water filtration devices. She had done a similar activity with her students in previous years, but in those earlier situation, she only showed students how a water filtration device works. This time she had the students actively involved in making and testing the devices. “Before I never let the kids do it, so after seeing how we did it (in the workshop), I thought, I’m going to try it this time, and OHHHHHHH! It was wonderful.” She was obviously excited that her students could be actively engaged rather than just watching.

Amanda spoke of an instructional strategy she learned that gave students a chance to process information. In making the water filtration devices, the students worked in pairs for the activity. Before they planned together, each student had time to think, draw and label his or her individual thoughts about what might work. She commented, “Giving them a chance to process and think about what they wanted to do on their own before

they began discussing with their partners was very valuable. So I learned that step that I thought was so crucial to the process."

Amanda also explained a change in instructional strategy that was successful in the classroom. Previously, when doing the drops on the penny activity to show cohesion of water, she had made it a contest. As a result, the students were not entirely truthful about the number of drops because they just wanted to be the winners. As suggested in the workshop, she removed the competitive aspect. "I made it all about observing instead of competition. Taking the contest competition out of it made it solely science observation, and it was awesome. It was literally like watching a science fiction movie. It was amazing to watch what was happening on their desktops and the comments and observations that were not only being verbalized but written down and sketched." Doing this activity in a different manner helped the students focus on the scientific concept rather than competing to win.

Gail was excited about how her students exhibited knowledge they had learned in the *Toss the Globe* activity. Originally, the students tossed the globe and recorded whether their left pinky was located on land or water. This activity provided a model for illustrating the percentage of water and land on the earth. They loved that activity, so she used the inflatable globe again for her students to share water facts they had learned. As the students caught the ball, they gave a fact about water they had learned. She was amazed at the variety of information they had learned throughout their study. "When they tossed the globe and gave the water facts, I literally got goose bumps."

When a teacher is excited about a topic, students also get excited. Gail summed up her feelings. “It was so exciting to have something that I was so excited about to watch them become excited, too.”

Modifications

The fourth category in rank order was modification of workshop activities. In the interview process, teachers mentioned modifications they made to activities 90 times. The subcategories that included reasons for the modifications: students’ understanding of concepts, students’ aptitude, time, and expense.

Understanding concepts. Linda discussed showing *The Lorax* video in addition to acting out the story because she felt seeing and hearing the story another way would make it easier for her students to understand and complete the activities associated with it. When learning the vocabulary, Beverly numbered the cards, pairs of students played a concentration-like game, and when they made a match, they also gave the definition.

Teachers often make decisions about how to teach a concept to their students based on what they think they will understand. Marilyn did not think her second graders would understand the difference between problems and issues, and instead chose to do cause and effect with *The Lorax*. Another second grade teacher found a way to help her students understand. Rhonda found a unique way to help her second graders understand the difference between a problem and an issue. “I gave them a scenario and told them if they felt one way about it to go to the left hand side of the room. If they felt the opposite, they would go to the right hand side of the room. If everyone was on one side of the room, it was a problem. If there were students on both sides of the room, it was an issue.”

She had used a very concrete way of thinking to help her young students understand an abstract concept.

Richard used another selection, *Flute's Journey*, by Lynne Cherry (1997) after reading *The Lorax* to give his students another opportunity to analyze an environmental issue. His students also read *There's an Owl in the Shower*, by Jean Craighead George (1997), another example of a book based on environmental problems and issues the students could analyze.

Giving students an opportunity to explain what happened in an activity helps them to better understand the concept. After using *The Incredible Journey* game, Beverly projected a picture of the water cycle model on her whiteboard and her students explained their journey as a water droplet while pointing to the various locations on the model. This gave them another opportunity to internalize the concept of the water cycle.

Students' abilities. Another reason teachers made modifications to the workshop activities was related to the abilities of their students. Linda commented, "I didn't think the kindergartners could learn all the motivator terms, so I cut out some of them so they could better understand those." Beverly pared down the motivator terms as well for the same reason. Some teachers described occasions when they considered making modifications, but did not. Marilyn and Rhonda both mentioned thinking about changing the terms. "I thought I would cut down the motivators, but I didn't. They did well, it was good to expose them to those words." "I thought about changing the words to make them simpler, but in the end, I chose not to, and they did just fine."

Alyson added the author's message to their analysis of *The Lorax* because they had studied that concept in their literacy class and it fit this selection so well. Author's message refers to an *Iowa Core Literacy Skill*, "identify the main purpose of a text, including what the author wants to answer, explain, or describe" (Iowa Department of Education, 2011, p. 16).

Time and expense. Teachers are often faced with limitations on time and money. It was no different in the implementation of this unit. Beverly put the motivator sheet on the whiteboard rather than making copies for each student, saving both time and paper. The students were able to identify those motivator terms using the technology in the same way they would have done on paper.

Jason read *The Lorax* to his students and did the motivator sheet concurrently to save time. The students had the motivator sheet in front of them as he was reading, and stopped him when he read one of the statements in the story. At that point, they talked about what they felt was the motivation mentioned in the passage.

Michelle used hand motions and sound effects rather than the props used in the eii workshop to save time and expense. Nancy's students created their own props for the acting out of *The Lorax*.

Beverly made an interesting modification that was originally because of expense, but later realized that it was beneficial to the students' understanding of a concept. In the professional development, after the teachers completed *The Incredible Journey* activity, they used the information from their logs to construct a water bracelet. Each entry on the log indicated where they had been in the water cycle. Different colors of beads signified

the locations they had visited in the water cycle. They gathered the beads that showed the path they had taken and threaded them through plastic lanyard so they could tell the story of their journey as a water droplet. Because of the expense, she did not want to purchase the colored beads, the students construct them of appropriate strips of colored paper and made a paper chain. This was beneficial later as they hung them around the classroom and as they were talking about the water cycle, they could see the paper chains and refer back to them. If they had made the bracelets, they would have taken them home and would no longer have them to refer to during discussion. In addition, to help them keep track of their starting point, she put their names on the first yellow paper loop designating the sun. This especially helped younger students keep track of the first step in the journey.

Curriculum Connections

Curriculum connections that teachers referred to in the interviews were ranked fifth with 70 occurrences. The research literature of effective professional development makes reference to the importance to teachers that professional development they participate in must connect with what they are teaching in the classroom. Subcategories included alignment with required state and national content standards, involvement of other teachers, local curriculum expectations, and the interdisciplinary aspect of the unit.

Alignment with state and national standards. Marilyn had her students find cause and effect examples in *The Lorax*. "Cause and effect is in the standards." Amanda listed the 4th grade standards addressed in the eii unit, "processes that shape the earth, erosion,

earthquakes, and floods." Alyson mentioned the correlation with standards. "We reap some success with Common Core and the Next Generation Science Standards."

Involvement with other teachers. Linda shared how other teachers were involved in the water unit. "They did the read aloud of *The Lorax* in the gym during their physical education class." The physical education teacher then developed a Lorax game in which the students were actively involved as truffula trees, bown barbaloots, swommee swans, and humming fish. The students begged to play the game again and again.

Alyson's students had been doing finger-knitting in their art class, so her students used their knitted creations as thneeds when acing out *The Lorax*. Although she did not mention this in the interview sessions, she described this in her unit lesson plan.

Local curriculum connections. Linda used a variety of techniques using *The Lorax* to practice skills from her local curriculum. "They made concept maps used for writing and re-telling. They first wrote the re-telling and drew pictures to match." In the use of *The Lorax*, Beverly explained a link to her curriculum, "It made them think in third person."

Alyson explained the use of *The Lorax* and ties to her curriculum. "It lent itself to our reading program, talking about author's message." Amanda described her new understanding of *The Lorax* and the tie to her curriculum. "I have read and heard of *The Lorax* before, but hadn't taken a literary look at it."

Roy talked about how the eii wildlife unit fit well into his previous curriculum. "We normally start with animals this time of year. These eii activities enhanced the unit I was already doing."

Alyson was pleased she was able to employ the Science Writing Heuristics (SWH) used by her school district with the eii unit. SWH is a teaching approach that incorporates collaborative inquiry activities, cooperative negotiation of conceptual understanding, and individual writing and reflection by the students (Norton-Meier, Hand, Hockenberry, & Wise, 2008). “It works very well with SWH, the students developed questions and sought evidence to support their claims.” Alyson elaborated on the use of SWH negotiation. “They used the negotiation piece in the water filtration systems, they negotiated with their partners. They took two sides in *Riparia’s River* (Caduto, 2011), and two sides on density.”

Travis also used the Science Writing Heuristics in his classroom and described the correlation. “It goes right along with the Science Writing Heuristics. They kind of lead the discussion with questions, and they research to find the answers, then present the results of what they have found.”

Amanda described the correlation with character education as her students were playing, *The Incredible Journey*. “The kids were able to put their social skills into play and cooperation.” In addition she explained how the eii unit aligned with math curriculum for her grade level. “We figured out the percentage of land and water and built a graph of different percentages. The kids had been struggling with that concept in math and this gave them another practice. It was a good application of what we had learned just a month ago.”

Connie described the correlation with her local curriculum. “It worked well because we had been studying water. We ended our unit with solids and liquids and then did some things with properties of water.”

Jason explained his students’ correlation with the Level III issue study and determining fact and opinion in the articles they read, a skill in his curriculum. “We talked about it being more opinion compared to saying certain facts in the articles and the view of the writers.”

Alyson described the connections to her curriculum and the eii unit. “They wrote hand-made thank-you notes to different community groups that supported our project. There is a huge connection with literacy. They are working on writing, note-taking, taking information from different sources, even computer-based sources.” In her lesson plan, she described how the students made character maps and personality profiles of the Onceler and the Lorax using evidence from the book.

Interdisciplinary aspects of the unit. Amanda elaborated on the interdisciplinary aspect of the eii unit. “They did lots of reading and math and learning about science concepts and it was all connected, even the fishing was connected. It’s cross-curricular, we had math topics and we’re hot and heavy into reading.”

Gail explained how she integrated the unit in two different content areas with two different groups of students. “With one group, I used the whole unit as reading. With the other group, it was reading with science. It’s perfect to put reading with whatever you want to study in science. I used *One Well*, (Strauss & Woods, 2007) as their reading material.”

Travis explained his use of *The River Ran Wild* (Cherry, 2002) with his students. "I do writing with science and asked questions about the connections between the story and water and they write about it. They wrote about how it takes a while for water to go bad, and it takes even longer to get it back—if you can get it back. It was very multidisciplinary." He also described that his students' design of a bridge for the Level IV action project crossed into another content area. "They did the plans for the bridge in math class."

Nancy's view of the multidisciplinary aspect described the appeal of the true/false booklets and how it played out the strengths of her students. "The artistic students could bring in their skills. Those gifted in writing and reading met their needs. The math students brought in math facts. All of them were working together on their strengths. There were many multidisciplinary things."

Amanda explained her experience with integrating all subject areas around science activities for the entire day. "Just thinking about taking a whole day and making it science, you can still pull in the different subjects. They were making connections between two pieces of literature, using their math and reading strategies."

Alyson emphasized the integration of the content areas. "The entire process was not only taught during science, but it was, we also utilized the reading and the writing, everything has to be integrated."

Rhonda explained her principal's interest in what she was doing with the eii unit. One aspect she noted was the connection to the Iowa Core Literacy Skill of text features. Text features are often taught with non-fiction such as the books Rhonda had gathered for

her students about water. Text features include; table of contents, key words, side bars, and hyperlinks. “That’s what she was noticing, that it was all inclusive—cross-curricular. Because with literacy, I was pulling out books all about water. They were also doing the text features with the books.”

Challenges

The sixth category according to our ranking was challenges teachers faced in the implementation. The teachers mentioned challenges 38 times during the interview process. Originally, the Time category was separate from the challenges category, but in the later stages of analysis, the decision was made to add time to this category as the comments fit the criteria. There were 19 instances of time mentioned, so after adding them together there were 47 instances. Subcategories for this category include: time, cognitive ability of the students, the availability of the students, limited resources, and help in the classroom.

Time. The time required to implement a unit such as this was a challenge mentioned by several of the teachers for a variety of reasons. “We have been interrupted so many times.” “It’s the end of the year, so I am rushing it.” “I think we ran out of time.” “I only see them twice a week.” Marilyn’s comment about time was qualified. “It is time consuming for 2nd grade, but I think it is worth it.” Gail’s statement was similar. “We were so hung up on time that if I did this again, we would read the book together and do the choral reading three or four more times. If I had more time, we could have revisited it and gone back and forth a couple of times and then did it as our finale.”

Beverly explained her students' involvement in *The Incredible Journey*. This is the activity in which the students play the part of a water molecule and toss a cube to determine their next location in the water cycle. While moving through the stations, the students keep a log of their journey, and then write about their trip through the water cycle at the end. "This took about four sessions. It took longer than I thought. I think my only frustration with the unit was time more than anything." Marilyn echoed her thoughts about the same activity. "That took some days to do."

Roy also referred to time for students to absorb the concepts and to complete the activity associated with it. His students were working on the true/false booklets in which the students researched a prairie animal and wrote true and false statements about the animals. They also drew pictures to accompany their statements. "It takes a couple of days for some of this to soak in. If you let them work on it longer, the quality goes real high."

Richard mentioned the advantage of doing the wildlife unit at the end of the school year, but also the time factor. "We only had twenty days of school left to do everything. On the flip side, the weather was nice enough to go outside for our action projects."

Cognitive abilities of the students. Alyson talked about the cognitive abilities of her students. "The hurdle for second graders to grasp the idea of issue and how you come up with a solution or how to have two sides to an issue." Connie made reference to the vocabulary. "Some of the words were harder than others." Marilyn thought some of the water properties activities were difficult for second graders. "It was really hard for

them—*The Clipper Ship*. They didn't have the patience to get it." This activity demonstrated the surface tension of water by seeing how many paper clips floated in a container of water. She also qualified her explanation about *The Incredible Journey* water cycle game. "While they were doing it, I don't think they really caught on—water cycle. We really had to explain it and reiterate it and show them and help them. We read a book about the water cycle that helped them understand. Another challenge was finding the space and they couldn't always find the stations on their own."

Ashley voiced concern about 1st graders understanding water properties. "The drops on the penny was over their head a little bit, the water tension was above and beyond first grade." Gail qualified her concern about first graders understanding the water cycle. "I was a little worried they would not comprehend it, but the song used definitions right in the song, and they sang it and then they knew it."

Teachers are asked to administer a pre and post-test with all of their students. This is prepared by the eii instructional team. The data is used to determine knowledge gained through the environmental issues unit. Beverly commented about the post-test which employed a Likert Scale to gauge their understanding. "I have to say the post test was confusing for the kids." She added that there was one question in particular that was difficult to answer.

Connie spoke about the difficulty of her students understanding the difference between a problem and an issue. "So to them, problem and issue are the same. They thought it was part of science and it was interesting, I'm not sure they connected that with issue."

Marilyn mentioned the difficulty of the Level III issues study with young students. “It was hard to come up with Level III, real environmental issues that second graders can identify with.” Alyson echoed that sentiment. “Understanding issue is difficult for second grade.”

Availability of the students. Nancy talked about the availability of her students. “The problem is there are always students phasing in and out.” Beverly echoed those thoughts. “I only get them for a certain amount of time, and I don’t get to extend it very often. Kids being absent and trying to catch them up was also a challenge.”

Limited resources. Alyson mentioned availability of materials to do the water experiments. Although all the activities and lessons were provided to the teachers, they had to find the materials to do the water properties’ experiments. “The only hard part of inquiry-based science is coming up with materials. Connie echoed that thought. “You figure out what to do with limited resources.”

Help in the classroom. The teachers also referred to the difficulty of doing some of the activities alone in the classroom. Amanda made reference to the making of density tubes. “It was definitely a two-teacher thing. We did it with two teachers in the co-teaching. While we were doing reading of the issues articles, the other teacher took groups and built the density tubes.”

Working with other teaching partners definitely is advantageous. Beverly heard others share about doing the unit with other teachers in their building or district and wished she had that support. “I was the only one who came to the workshop from my school.”

Other Resources

The seventh category, with 37 instances was Other Resources. The teachers added other resources in addition to those they received in the eii workshop. Subcategories were printed resources and electronic resources.

Printed resources. Travis used an alternative to *The Lorax* because he had used that previously with his students. "We used *The River Ran Wild*, (Cherry, 1997) for the issue analysis instead of *The Lorax* because we had already done that."

Ashley used resources from the *Project Wet* (2015) curriculum. "We did the balancing the globe and the water meter from Project Wet."

Rhonda used *Thirsten's Wacky Water Adventures* (2004) with her first graders. It is a comic book like story about conserving and protecting water available online from the EPA. She also used the *Scholastic News* issue on water, "which fit perfectly."

Nancy found a local newspaper to use in the issue study. "The *Ames Bulletin Board* had an article about grazing goats reviving the prairie." She also used an app on the iPad that helps identify plants.

Rhonda shared resources her students received. "They got coloring books from the Water Works." She also used a website she learned about in a technology class. "I found a place where now I can easily turn down the vocabulary to the kid's level. It is called Evernote." This is an iPad application Rhonda used that would change the level of the vocabulary words she entered into the program.

Alyson and Gail found plenty of print resources from the local Area Education Agency (AEA) book lending library. Richard used another print resource in his wildlife

unit that was introduced in a previous eii workshop he had taken. “We used *Pass the Energy, Please* (McKinney, 2000) and included the study of energy passage in our study of animals.”

Online resources. Gail incorporated some online resources as well as hands-on materials in the unit. “I also showed a water conservation video from Sesame Street (2015) because he shows them you shouldn’t leave the water running when you’re brushing your teeth. I also bring a five-gallon bucket so they know that they use 100 gallons a day and how much a 5 gallon bucket of water weighs. I pass it around, and they find out how heavy it is.” Gail made a power point with important facts about water and “showed a video that showed how far people in Africa have to walk to get water.”

Gail used other resources to help her first graders learn about the water cycle. “We worked on the water cycle song I found online that taught the terms and meanings of the words. I wrote a rap about water that we also used. The students made their own aquifer in a clear plastic cup. I brought in a hot plate to show the steam and watch how water evaporates.”

Richard used a video clip about bees in the study of prairie wildlife. He also incorporated other pieces of literature. “There are great books by Jean Craighead George, *One Day in the Alpine Tundra* (1995), *One Day in the Tropical Rain Forest* (1995), *One Day on the Prairie* (1996), and others in that series. He also used a video entitled *Pull to Pull* from the Planet Earth series.

Future Use

The eighth category, with 27 occurrences was future use of the lessons and activities. Most often the teachers mentioned how they might use what they learned in the workshop with their students in the future. Occasionally, they mentioned activities they would not use again.

Activities to use in the future. Beverly talked about incorporating the eii instructional model with other studies in her classroom. “I can see taking our study of habitats even further using the eii levels.”

Amanda had several activities she planned to do in the future. “I will use the water usage chart, I’m going to use that again.” She also mentioned incorporating more technology in the future. “Next year with 1:1 iPads, it will be great. I would like to try an interactive journal instead of paper, but you can’t replace hand drawing. I will allow more time for the water testing. I have a stream table that I didn’t pull out.” She brainstormed ways to include water in their Iowa studies. “We could do industry on the river, towns on rivers, why the majority of towns are on rivers.” She also plans to expand the trips outside of the classroom. “We will continue the fishing and then go straight to the water treatment plant.” She also commented about how she was going to dig up prairie roots the next year. “And next year, when I do it again, I’m going to take one of those tree spades.”

Ashley’s first graders were making plans for the next year. They could not complete their action project because of construction. “They are ready to do it next year after we come back. They also want to perform *The Lorax* for my next class coming in.”

Nancy also has plans for the upcoming years as she will have some of the same students in subsequent years. “This is a project I can keep using with the new students that come in in fourth and fifth and sixth grade.”

Rhonda explained about future use in her school. “The students know it’s not a one-year thing. It’s going to continue. They invited our principal in and presented to her and told her what we were doing. She usually doesn’t go for anything that is not right in the curriculum. She saw what we were doing and said to go ahead. She would find a spot for the garden.” Rhonda elaborated on her plans. “Next year I will have at least 50 second-graders to do the unit with. I will definitely do the water filter activity. I don’t know if I will include the pH.”

Activities to eliminate in the future. Rhonda spoke of eliminating one activity in the future. “I don’t know if I would do the little motivator book with them again, because it took a long time to write.” She explained further that she felt they understood the motivators with the other activities they did.

Experts

The next category was called experts. Teachers often invited experts in the field to assist them in teaching the unit with their students. This was modeled for the teachers in the eii workshop as several expert guest speakers spoke to the groups. It was again difficult to develop subcategories with the wide variety the teachers mentioned. They ranged from college professors to naturalists to farmers.

College professor. Alyson had a college professor and her students come to her classroom and perform *The Lorax*. They helped make the true/false booklets with her

students. She also brought in a birder. “She came down from Des Moines and helped us establish the bluebird trail.” In addition, she consulted a sign expert for their prairie signage project. “The sign expert said all the signs should face north.”

Naturalist. Amanda invited a local naturalist who brought a water table for the students to have experience with erosion. Rhonda also invited a county conservationist who came twice to her classroom. “She brought a water preservation game for the students to play and another time brought prairie grasses and talked about their roots.”

Local farmers. Travis invited local farmers to talk about their farming practices. “They talked about their farming practices and how farmers are somewhat at fault for the water problems and what they can do about it. I also invited a former teacher who now works with Pheasants Forever and tries to help Pheasants Forever chapters acquire land and plant native grasses and establish habitat for pheasants. He talked about different things to improve water quality and habitat.”

AEA science consultant. Linda brought in a science consultant from her local AEA to assist with the unit. She also invited a naturalist to talk about prairies. “A fellow from the county did a talk about watersheds with the kids and run-off and stuff and did experiments with them in a Tupperware container. He brought different glasses of water from nearby streams. We filtered it. A lady also came from the county and talked about precipitation and water.”

Service-learning, Green Iowa, and animal control. Beverly invited several experts to talk with her students about various environmental topics. “There was a service-

learning expert who talked about community, a speaker from Green Iowa, and an animal control expert."

IOWATER and parents. Jason included experts on their field trip to test water. "I got the equipment from the IOWATER people. Also a few of the dads that came along were engineers or worked at John Deere."

Trees forever. Michelle asked for and received advice from a consultant from Trees Forever as she and her students were planning their action project. He gave them valuable information about where to plant prairie and what varieties to use for the best results.

Outside the Classroom

The tenth category, with 22 instances mentioned by the participating teachers in the interview process was outside the classroom. Teachers indicated locations where they took their students outside the classroom during their eii unit study. Some activities took place close to the school on the playground and others were field trip excursions.

Near the classroom. Beverly's students "actually picked up litter and planted trees." Amanda explained about the outside activities she did with her students. "We acted out the Earth's atmosphere outside. The best outdoor activity was—memories made for sure—fishing as well as the water testing."

Alyson took her students outside several times. "We went out on the playground and looked at the grass, and then out on the prairie to compare the two. We went out and observed water absorption as we were studying the water cycle. We spent a lot of time outside when we were establishing the bluebird trail and putting the signs for the wildlife

in the prairie." Rhonda commented about her students' outdoor excursion. "The county conservationist brought snow shoes and the students found they could walk on water."

Field trips. Gail explained the field trip her students took. "We went to Twin Ponds by Ionia and there were many opportunities to make connections to our water unit."

Linda's students went to a local nature center for activities. "We actually went out there and did a scavenger hunt with different roots and related them to the posters. The naturalist took us to the prairie and we looked at native grasses again and talked about the roots. He pulled out a few so they could see.

Michelle took her students outside the classroom several times. "We took a trip to Neal Smith Prairie Center, we walked to different areas in town, and to the public roadway bike trail."

Travis took his students fishing in January when the temperature was far below zero. "So we went fishing anyway—despite the cold, and maybe two people got in the tent for about five minutes to warm up a bit, the rest of the time they were on the ice fishing."

Local Community Connections

The eleventh category, with 21 instances mentioned during the interview process was local community connections. In this category, teachers described connections to their local communities they and their students made during the eii unit.

Connecting with our town. Alyson and her students made connections to the local community in their discussion of *The Lorax.* "We talked about how we could help *The Lorax* right here in our own town."

When Marilyn's students were examining environmental issues, they looked at their own community. "We talked about the environment and things that related to our town."

Nearby bodies of water. Travis and his students found a newspaper article about a nearby lake the students often swam and played in. "They started talking about the lake after finding an article that said they should not swim there and they wondered why."

Many of the students in Travis's class live on farms and were able to make great connections when talking about water quality. "A lot of the students' parents are farmers, they could instantly take it into their own life. They talked about irrigation and other issues." They also make connections to a local river. "They related *The River Ran Wild* (Cherry, 2002) to that river and how it changed because of a manure spill." In studying water pollution and water quality in Iowa his students' research made local connections. "Iowa plays a huge part (in water quality) and they are taking steps on their own to make it better."

Flooding. Ashley explained the local community connections her students made with the water unit. "Flooding was a big thing in our area, the kids were really aware of the flooding and the damage they had in their homes. They made really good connections to our water study and their own lives." The community connection for Ashley's class was evident for all to see, "Even on our last day of school it ended up flooding."

Iowa critters. Roy talked about the connection his students made to animals they might commonly see when creating the true/false booklets. “They were researching the critters that are found in our area.”

Connections with action projects. Nancy’s class was interested in planting some prairie for their Level IV action project, but wanted community members to learn about the prairie so they would be more accepting of that type of planting. “We are trying to inform the community before we plant prairie.”

When Alyson’s students were working on the signage project, they involved the community in many ways. “I called the city and got posts for the signs from the light and power company. A parent worked at the sign company and could produce the signs at cost. Parents and others brought in money left and right to fund the project.”

As Gail’s students learned about wasting water, they took action in their own homes as reported by a teacher whose daughter was in the class. “She asked for a bucket to put in the shower because we could save the cold water we send down the drain before the water gets warm and use that water in other places.”

Roy includes the students he will teach the next year when planting their school garden as well as other community members. “The third graders invite the second graders to do our planting portion. We invite mom, dad, grandma, grandpa, and others in the community.”

Support

The twelfth category is support with various types of support mentioned 16 times by teachers during the interviews. The category is divided into two sections; support from administration and support from others.

Administrative support. Ashley explained support from her principal, “The principal came in and we presented the reader’s theatre to her. She really got into it.”

Gail’s principal was also impressed with *The Lorax* presentation. “The principal taped *The Lorax* play with his iPad, he thought it was so neat.”

Nancy worked with students in two schools and received mixed support from her administrators. “I talked with both principals about taking the students to Neal Smith National Wildlife Refuge, in Prairie City, Iowa, one actually said no and the other said, yes.”

Jason described the support he received for a Saturday field trip he and his students took to a nearby stream to test water quality. “Their parents came along. My administrative staff is pretty helpful and they really support creative ideas like that, too.”

Travis explained his principal’s concern about the severely cold weather as he was taking his students ice fishing on a cold January day when the temperature was below zero. “The principal was a little worried. I told her I had lined up several adults with tents and heaters and she said go ahead and go.” He elaborated on her support in light of his students’ test scores in science on standardized tests. “She is very supportive as long as the scores are what they are on the standardized tests.”

Support from others. Beverly's students shared what they had been learning at school with their parents. "They were able to tell their parents about it, and that is the best part." Gail worked with another fourth grade teacher "who thought the unit was great. Other teachers in the school heard about the unit and there was excitement throughout the school."

Amanda's husband was very supportive as she and her students were working on their signage project. "My husband was there to help me with anything that I needed or didn't know how to do." She elaborated about support from the parents of her students for the project. "The entire project was covered with parent support."

Travis received support from local companies that provided paver's blocks and lumber to build a little troll bridge. His superintendent is also very supportive of this project as it will potentially alleviate a drainage problem by building the walking bridge.

Rank Order Conclusion

This concludes the evidence from the interviews analyzed in the rank order of the categories. Another viewpoint to examine the data was through the lens of the four levels of the eii instructional model as shown in Table 8. The following analysis was based on those four instructional levels with the inclusion of the previously identified categories.

Table 8

Coded Categories of Interview Data by eii Levels

Categories	**Level I**	**Level II**	**Level III**	**Level IV**	**Totals**
Student Engagement	34	151	23	27	235
Workshop Activities	45	66	4	0	115
Teacher Enthusiasm/Success	10	53	9	22	94
Modification	28	58	2	2	90
Curr. Conn	10	38	6	16	70
Challenges/Time	11	37	3	6	57
Other Resources	1	32	0	4	37
Future Use	1	15	2	9	27
Experts	1	17	4	5	27
Outside the Classroom	2	16	2	2	22
Local Community Connections	1	7	2	11	21
Support	2	4	2	8	16

Interview Data Analysis by eii Instructional Model Levels

Level I: What is an Environmental Issue?

Level I of the eii instructional model introduced the concept of environmental issues and taught the difference between an environmental problem and an environmental issue. *The Lorax*, by Dr. Seuss was used to illustrate two distinct beliefs of the characters about the environmental issue and their motivating factors. Four of the coded categories were prevalent in the data for Level I, workshop activities, student engagement, modifications, and curriculum connections.

Workshop activities. Workshop Activities was mentioned 45 times in Level I by the teachers during the interview process. This ranked second to Level II for this

category. The understanding of the difference between problems and issues was key for the implementation of this unit as well as the motivation of the characters in the story.

The Lorax

Fourteen of the 15 teachers used *The Lorax* to teach this concept. The fifteenth teacher had attended previous eii workshops and had already done *The Lorax* with his students, so he used another title, *The River Ran Wild* (1997), by Lynne Cherry which also illustrates environmental problems and issues.

The Motivators

Fourteen of the 15 teachers used the motivator vocabulary as well as the motivator booklets. The study of the motivators helped their students understand why people take a side in an issue based on their beliefs. The fifteenth teacher had done this with his students earlier in the year.

Student engagement. Student Engagement was mentioned 34 times in Level I in the interviews. The teachers illustrated the engaging aspects of acting out *The Lorax* and the accompanying activities which include *The Lorax* booklet, Naming the Motivators, the Motivators' booklet, and the issue analysis web.

The Lorax

Beverly commented about the engagement of her students when acting out and discussing *The Lorax*. "It was a great activity for them to think about working together as a community in a group activity. It was also interesting how it made them take sides and persuade the other side." Alyson's students pondered the connection between *The Lorax*

and their own town. “They started coming up with ideas and thoughts and what they could do to help the environment in their town.”

Rhonda was surprised that her “second graders understood the difference between a problem and an issue better than I thought they would.”

The Motivators

Connie’s students did the reader’s theatre of *The Lorax* with props and then moved on to the motivator discussion. “It helped them to understand why people are motivated to do different things. They talked about what motivated them to do well in school.” There are suggested terms for the motivators, but teachers and their students are encouraged to use words they are familiar with to label the pictures on the motivator sheet. Beverly commented about how her students, “came up with all kinds of the different motivator words.” Marilyn talked about how quickly her students picked up the words and used them. “They really mastered the language of those words. Their favorite word was aesthetic, they used it all the time.”

Modifications. The third category in Level I with 28 instances was Modifications. Modifications of the lessons and activities were often made by teachers when teaching about problems and issues in the first level.

The Lorax

Linda’s students acted out *The Lorax* as well as watching the video. Beverly appointed a fluent reader to read the story as the others read along and joined in with their props. Beverly had mix of grade levels in her group and “the Kindergartners couldn’t read it, so a fourth grader in that group read the story.” Amanda’s students “took *The*

Lorax to the Kindergarten and acted it out." Jason older students enjoyed watching an electronic version of "a guy with a British accent" reading *The Lorax*. Michelle's students creatively developed "hand motions and sound effects" instead of props. Nancy did not provide the props, but had her students create them as an art project. Richard's students followed *The Lorax* with *Flute's Journey* (1997) to give them another opportunity to analyze environmental problems and issues. Marilyn's students made cause and effect charts to explain problems and issues in *The Lorax*. Alyson's students looked for the author's message as they had been doing in their reading class.

The Motivators

Beverly projected the motivator sheets electronically on her whiteboard as they discussed them. Marilyn and Rhonda thought about cutting out some of the motivator terms, but did not and were pleased with the outcome. "It was good to expose them to those words." Linda made a blank grid for the motivator terms and the pictures, so "they could cut them out, talk about them, and paste them in the correct spot."

Vocabulary

In addition to the motivator terms, each eii unit had vocabulary terms that are essential to the theme. Teachers used these in a variety of ways. Beverly's students "used those vocabulary cards and quizzed each other about the definitions." Ashley narrowed down the vocabulary for her students, "and found some videos online that helped with the words." Nancy had a mixed age group and had older students "help the younger ones with the vocabulary."

Challenges/time. The fourth category with 11 instances in Level I was the combined categories of Challenges/Time. The challenges that most teachers mentioned were time and helping students understand key concepts.

Time

Beverly asked her students to not only put the vocabulary definitions on the cards, but to put them in order of how they were numbered. “I wanted to challenge them, but it took longer than I thought.”

Nancy’s challenge with time was students “always phasing in and out” and trying to catch them up when they were gone. Roy’s comment was similar in regard to having blocks of time to complete activities. “We have been interrupted a couple of times.” As the end of the year approached, many teachers were strapped for time. “I’m starting to rush it,” was Rhonda’s comment. Gail felt the same time pressure, “We were so hung up on time, if I did it again, we would read the book together and do the choral reading three or four more times. It’s a time factor.”

Understanding Concepts

Alyson shared her thoughts about young students learning the difference between a problem and an issue. “It was a hurdle for second graders to grasp, that idea of issue and you come up with a solution or how to have two sides to an issue.”

Richard mentioned in his unit lesson report that some of the motivator pictures were confusing and suggested they might be modified so students could understand them better.

Curriculum connections. There was a tie for fifth for the category that was most prevalent in Level I with 10 instances; Curriculum Connections and Teacher Enthusiasm. Curriculum Connections are described first. The necessity of connecting with the curriculum is essential for teachers to implement such a unit in their classrooms. The two subcategories are; Connections with Standards and Other Curriculum Connections.

Connections with Standards

Linda worked with the physical education teacher that also had attended the workshop in teaching the eii unit. After Linda's students acted out *The Lorax* in class, the P. E. teacher developed an engaging game to play in the gym based on the story. The students begged to play it again and again so "they could save the truffula trees." Linda's students made concept maps of the story, "used with writing and re-telling. The students wrote their retelling of the story and drew pictures to match." Re-telling a story is a literacy skill found in her Kindergarten curriculum. Beverly's students practiced the skill of "thinking in third person" as they analyzed the story. Marilyn's students' use of cause and effect was supported as it is found in their standards. Alyson commented that *The Lorax* "lent itself to our reading program, talking about author's message, and connected with the Common Core Curriculum and the Next Generation Science Standards." Amanda appreciated a new view of a book she was familiar with, but was able to "take a literary look at *The Lorax*."

Other Curriculum Connections

Roy commented that his students had studied animals in the past, but this fresh look at the animals found in Iowa offered new ideas and materials to freshen up that study.

Teacher enthusiasm. The other category that ranked fifth in Level I with 10 instances mentioned in the interviews was Teacher Enthusiasm. The teachers explained their enthusiasm in the use of *The Lorax* and the study of the motivation of the characters.

The Lorax

Linda described her students' understanding that the animals had to leave in *The Lorax* because of the pollution from the factory. "They got it, it was awesome." Gail mentioned comments from other teachers in the building. "I loved *The Lorax* and the other teachers commented how intrigued the students were with it." Jason remarked about the active involvement of the students in the acting out of *The Lorax*. "My favorite was the hands-on aspect of it."

The motivators

Beverly explained that she was pleased she had not modified the terms used in The Motivator booklet as her students understood and used the terms in their everyday vocabulary. "It was a lot fun, it was cool to see." Rhonda echoed that thought, "It was just so cool to hear them use that vocabulary." Gail also remarked about the motivators. "I wasn't sure how the motivators would go, so I was really amazed and excited, because they really got it, I thought, they can't understand this, but they did, they got it"

Level II: What are the Ecological Foundations?

Level II encompasses more activities than the other levels, both in the eii workshop and in the implementation by the teachers in their classrooms. The science knowledge needed to understand the environmental issue was presented within this level. The nine categories described in this section were mentioned 10 or more times in the interviews. They included; Student Engagement, Workshop Activities, Modifications, Teacher Enthusiasm, Curriculum Connections, Challenges, Other Resources, Outside the Classroom, and Future Use. Most of these activities have been described in detail previously in the rank order analysis, but are organized in a unique way.

Student engagement. The category mentioned most frequently in Level II, with 151 instances by all 15 teachers was Student Engagement. Involving students in a hands-on, inquiry-based, constructivist engaging manner is well supported by the research community and documented in the literature review of this study. Teachers described a multitude of ways in which their students were actively engaged in the learning of the science concepts in this unit. Subcategories included comprehension of the science concepts and student enjoyment.

Comprehension of science concepts

The understanding of the water cycle was a major science concept of this unit. As the teachers described earlier, the game the students played in which they played the part of a water droplet, helped them understand the water cycle. All 10 of the teachers that did the *Preserving and Protecting Our Water Resources* unit used that water cycle activity with their students.

In the *Wildlife of Prairie Roadsides* unit, Alyson took her students outside to engage them in the discovery of differences between the prairie roots and lawn grass roots. They actually dug them up and were able to see the differences in length. Through that experience, the students were able to draw conclusions about the value of the prairie plants in water absorption as compared to lawn grass. “Those roots can’t get the rain down into the soil because they are too short. That’s why grass dies right away when there is no rain.” Alyson said, “It was great for the students to internalize their understanding.”

Connie talked about the value of the water properties’ experiments her students did. “It was a lot of experiments, but the students understood.” When Ashley’s students kept track of their water usage, they made changes in their habits, trying to cut down on how much they used. “They changed faucets at home, took shorter showers, and turned off the faucet when brushing their teeth.” Travis talked about those same activities, “With all the hands-on stuff-that really sinks in more than a textbook.”

Rhonda found it very interesting that her students recalled where the vocabulary words had been posted even after they were taken down. They would point to a spot on the wall when they were talking about a term. They did the same with location of areas from the water cycle game. “They might refer to the pond, and point to where it had been.” In a strange sort of way, the location was tied to the understanding. Even though the space in her classroom was small to play that game, she was glad she had, because the students would make reference to the locations of where the water droplet went.

Gail used resource books from the local AEA for her students to read and learn facts about water. They created their own lists and then networked with classmates to add to their lists. Incorporating this cooperative social networking exercise allowed the students to check their list with classmates and find out what they did not have. It was an engaging way to do research. Pairing it with the tossing of the globe to share the facts gave the students another opportunity to rehearse what they were learning.

Travis put his students in charge of their own learning about water facts. First, he set out a cup of water and asked a few simple questions. “What is it? Where does it come from? How do we use it?” From that point, the students started asking questions and did the research to find their own answers. “Many times they take off on an idea and keep researching to find answers.” He also found them referring back to the vocabulary. “They kept seeing those words over and over, and would point to the wall.” When Amanda’s students started working on their water filters, she asked them if they knew what pH was. “Several students grabbed for their vocabulary word cards, they didn’t remember what it was, but knew that had heard of it, and knew where to find the answer.”

As Amanda’s students were putting together the water properties puzzle, they were able to explain why they placed pieces where they did and they were able to point out terms they had not studied yet in the water unit. “They were thinking, density, we don’t know that word yet.” They were able to make good guesses about where it belonged because of the pictures and their prior learning.

Student enjoyment of science lessons and activities

Teachers exclaimed again and again about the enjoyment of their students when engaged in the science activities. After Richard's students made the true/false booklets they shared them with their classmates, "trying to hide their answers from each other—it was a lot of fun."

Travis's students exclaimed how much fun it was to find the vocabulary terms. "They really enjoyed it, they did!"

Marilyn described her students' feelings about the water properties activities. "The kids loved that one, it was their favorite, filling Lincoln's hat." Beverly described her students while they were playing the water cycle game. "The kids were having fun." Connie also commented about the hands-on water activities. "That was really a fun part for the kids, the experiments were great, any of the hands-on things we did, they thought was great." Jason had the students carry around their own dice for the water cycle game, "I did that with first grade and they thought it was fun."

Workshop activities. The second most mentioned category in Level II by all 15 teachers was Workshop Activities with 66 instances. This was no surprise as that was the intent of the interview to have the teachers describe what they had done from the eii unit in their classrooms. These activities and lessons have been described in detail elsewhere in this study in the explanations of the other categories.

It might be interesting to note activities from the teacher workshop that teachers chose not to do, or those very few teachers used. Only a few teachers mentioned activities or lessons they did not do.

Only three of the 10 teachers chose to do the water filtration activity in which the students built their own water filtration devices from plastic bottles, chose materials to filter with, and filtered polluted water. The activity required a lot of preparation, materials, and a lot of time, making it difficult for teachers and students to complete in one class period. If it could not be completed in one class period, one would need to find a place to store all materials in between.

Another activity that only one teacher used was the water properties puzzle in which students matched terms and pictures describing water properties. Again, this requires some preparation time, to duplicate the pieces, cut them out, and organize. A color printer is needed to properly show the pieces, and not all teachers have access to that technology.

Modifications. The third most mentioned category in Level II was modifications with 58 instances from 12 teachers. Many modifications were described in detail in the rank order section, so only new examples were noted here. Some are additional activities the teachers implemented to help their students better understand the science concepts.

Linda's modification of the water properties activities was because an expert she had invited to the classroom prepared the activities for the students. "He did several similar activities with the students, like solubility, the drops on the penny, and a salt water taste test."

Marilyn explained she did some "prep work before the water cycle game. We read a water cycle book. We read it both before and after the activity to help them better understand the water cycle." Allison's students tossed a ball of yarn to illustrate "a

human food chain" which illustrated how energy passes from one creature to another in their study of prairie wildlife. Connie's students had been studying solids, liquids, and gases and continued doing water experiments with this unit. "We did the flower experiment where the colored water through the flower to see how that worked." As Amanda's students were doing water properties activities, they "sort of went off on evaporation." They created their own experiment with colored and non-colored water to see which would evaporate first.

Larry modified the solubility activity using materials readily available in his classroom. The students also made suggestions and brought things from home. "The main test was solubility, we took different things like hot chocolate powder, a piece of plastic, a napkin, and pencil shavings."

One modification made by a teacher would affect the outcome of the understanding of the concept. This teacher did not make the cubes for the water cycle game. He just had them roll a die, thinking it had the same number of sides as the paper cubes. The problem was that the paper cubes represent the way a water droplet moves through the water cycle. The cubes illustrate the difficulty of leaving certain areas for the water molecule by having the same picture on some sides of the cube. Using the die would change the results because of the even distribution of the numbers.

Ashley did an activity in which her students were trying to balance the globe with strings as an entire class. Eventually, they were unable to keep the earth in balance, illustrating the difficulty humans have in trying to balance the use of water.

Rhonda's students tested snow water they had collected. She obtained some pH strips from the high school. We collected the cleanest snow we could and the dirtiest snow then some in between."

Roy prepared a sample true/false booklet for his students about buffalo. "I researched American buffalo as an example for them." He had also added the buffalo to the list of Iowa prairie animals. The workshop list only included present Iowa prairie animals and he wanted them to also learn about some that are not here. He redesigned the booklet from the workshop adding lines for his students to write on. His students also created a spiral-bound booklet with poetry and prose they had written about the prairie animals after their visit to a local natural area. His students created cinquains about Iowa wildlife. Cinquains are a class of poetry that employ a 5-line pattern. He mentioned these in the interview and included copies of the poetry and prose with the materials he turned in with his unit lesson plans.

Teacher enthusiasm. The fourth most mentioned category in Level II was teacher enthusiasm with 53 instances by 13 of the teachers. The teachers were quite enthusiastic about what their students were learning about and understanding as well as what they had learned at the eii workshop.

Teacher Remarks

Their remarks were an indication of their enthusiasm. "Oh wow! That's really special. That's pretty cool. I like that idea. "That was a fun one" is how Linda described the activity in which her students were dissolving various substances in water. "That made me feel good" was Beverly's remark about her students sharing knowledge about

water quality in discussion with a guest speaker. She also remarked about their transfer of knowledge when they explained how much water was wasted while brushing teeth and leaving the faucet on.

Enthusiasm about the eii Workshop

They also described their enthusiasm about the eii workshop. “It’s just an awesome class, my coordinator suggested it to me.” “With eii, we got to talk, we got to work together.” “That’s what I like about these classes is that I can actually bring it back and do the activities right away.” Gail mentioned learning from other teachers at the update session. “It’s amazing to hear at the update what other teachers had done, it gets you pumped up again.” Nancy described her new knowledge about prairies. “After taking the class, I totally understood the concept behind it (planting prairies) and now I am kind of defensive if anybody criticizes it.”

Curriculum connections. The fourth most mentioned category in Level II was Curriculum Connections mentioned 38 times by eight of the participating teachers. References were made to connections to current curriculum, connections to the Science Writing Heuristics, connections of activities within the unit with others in the unit, and interdisciplinary education.

Current Curriculum

Connie shared that her students had been studying properties of water, and she was able to piggyback that study with this study of water quality. “It worked out well because we had been studying water, we ended our unit with solids and liquids and did

some things with properties of water." Roy's previous study of animals was enhanced with this theme of native Iowa prairie animals.

Science Writing Heuristics

Alyson, Amanda, and Jason commented how well the eii format of instruction fit with their use of the Science Writing Heuristics. The study of water quality problems and issues was easy to use with their focus on writing and investigating. "The students kind of lead the discussion with questions and then they research to find out the answers, then present the results of what they have found."

Vocabulary

Richard, Jason, and Travis liked when their students were using the vocabulary learned early in the unit throughout their study of water and animals. "They kept bringing the vocabulary back into the discussion."

Interdisciplinary Teaching and Learning

Gail expressed her use of interdisciplinary teaching and learning. She was able to intertwine reading, math, science, and social studies in their water study. Amanda spoke of the ties with all content areas. "The curricular ties in with math, social studies, reading, and of course, the science."

Challenges. Challenges were mentioned 26 times in Level II by 8 of the participating teachers. Time, Understanding of Concepts, Supervision, and Materials were all mentioned as challenges during the interview process.

Time

Teachers face the challenge of the amount of time for lessons and activities each and every school day. Challenges implementing the eii unit were no different. Nancy, Michelle, Jason, and Beverly had students of various ages coming and going throughout the day. It was challenging to complete lessons and activities as well as catch students up that had missed.

Understanding of Concepts

Another challenge mentioned in the interview process was how to help students understand various concepts. Some felt learning the difference between a problem and an issue was challenging, while others of students of the same age and grade level found concrete ways to help their students understand the difference. Rhonda related that her students had trouble understanding water tension and enjoyed the water cycle game, but wasn't sure if they truly understood it. Gail felt the water cycle was hard for young students to understand, but thought the use of a song helped them comprehend it. Marilyn mentioned her students' lack of patience when trying to place paper clips on water to show water tension as a challenge.

Supervision

Teachers that worked together had an advantage over those who implemented the unit on their own. Amanda spoke about her students making individual density tubes and how difficult it would be to do that activity with only one adult. Connie worked with another teacher and echoed Amanda's thoughts about trying to do the water properties

activities alone. Marilyn mentioned having all the water properties activities all set up before class started so they could jump right into them.

Materials

Alyson and Beverly both mentioned the difficulty in coming up with the materials to do hands-on science. “Budgets are tight, and many times, teachers pay for them out of their own pockets.”

Other resources. A total of 7 teachers mentioned Other Resources 32 times. Other resources were used in both the *Preserving and Protecting Our Water Resources* and *Wildlife of Prairie Roadsides*.

Preserving and Protecting Our Water Resources

Ashley integrated activities she found on the Project Wet (2015) website that added to the study on water use and quality. Rhonda used the S*cholastic News* which focused on water problems. She also used an online magazine, *Thirsten’s Water Cycle Adventures* along with other materials found on that website by the Environmental Protection Agency (http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html). Gail wrote a rap about the water cycle and found a water cycle song online that she used with her students. Nancy found an article in the local newspaper that told how grazing goats were reviving the prairie.

Wildlife of Prairie Roadsides

Roy used resources from the school library to help his students find information about Iowa prairie animals for their true/false booklets. Richard used several books by

Jean Craighead George, including, *There's An Owl in the Shower* (1997) and *One Day in the Prairie* (1996) to enhance his students' knowledge of animal problem and issues.

Outside the Classroom. A total of 8 teachers mentioned taking their students *Outside the Classroom*, 16 times. Some of those took place under the direction of the teacher and others included another person leading the activities.

Teacher Led

Alyson took her students outside numerous times including the playground, the prairie and the nearby bike trail to observe the animals found nearby. Amanda's students went outside to role play the earth's atmosphere. Nancy's students walked to different areas in town and the bike trail to observe the prairie plots and the animals found there.

Led by Others

Ashley's students were helped by their parents when they kept track of how much water their family used in a week. Rhonda's students learned about the solid state of water when the local naturalist took them snow-shoeing. Another naturalist made many connections to the water unit for Gail's students.

Future uses. There were five teachers that mentioned future use 15 times in Level II. Some spoke in specifics while others spoke more in general of future use of the model, lessons, activities, and materials.

General Comments

Nancy described using this unit with future students in fourth and fifth grade. Beverly spoke about using the eii model in her unit on habitats for zoo animals. Ashley wants to do the unit next year only earlier in the year.

Specifics

Rhonda spoke of specific activities she would use in the future. “I will definitely do the water filtration activity, but don’t think I will use pH with them.” Amanda listed several activities she plans to use in the future; the water usage chart, water testing, an interactive journal, the stream table, visit the water treatment plant and fishing. She also plans to integrate her study of Iowa and include Iowa industry and the relationship to water and river towns.

Level III: What are the local environmental issues?

During Level III of the eii instructional model, teachers engaged the students in examination of real environmental issues in the same manner as they did with *The Lorax* in Level I. Students study an issue from their own state or community and analyze the problem, issue, characters, and motivation. Real issues are more complex than the storybook issue found in *The Lorax.* Some teachers chose to use the issue articles they had experienced in the eii workshop and others chose to find an issue that is close to home or more appropriate for their students.

Articles from the eii workshop. Jason used the articles from the workshop which focused on nitrates in our streams and in the Des Moines city water system. He sent them home with the students to read ahead of their discussion. “We talked again about the difference between a problem and an issue.” The students had highlighted the problems, issues, characters, and motivation at home so they could dive right into the discussion the next day.

Other Issues Articles. Amanda's students used two articles they found in their research that fit local issues of water quality and paired those with the book, *Riparia's River* (2011). They read the book and the articles in small groups and created comparison charts showing the problems, the issues, the characters, and their motivation and then shared their ideas with the class. Amanda was pleased with the comparisons and conclusions her students made and what they learned from each other. "That was valuable to them, to hear what other kids thought. I enjoyed watching my higher level thinking students explain about what was going on, the kids that were still concrete thinkers were learning from what the others were thinking."

Connie used the book, *One Well* (Strauss & Woods, 2007), to talk about issues with her second graders, then asked a local naturalist for ideas about water quality issues that her students would understand and care about. The naturalist made several suggestions, but the one that stuck was people taking care of dog waste when out walking their pets. Connie found a website that focused on that issue and did several activities with her students which also led to their Level IV action. "They were invested in the discussion, they loved talking about poop, and most of them have dogs."

Gail used water quantity problems and issues in California that was prevalent in the newspaper and on television. "It was neat to see them see how that's an issue because everybody wants the water."

Jake's students analyzed the problem and issues about the water quality of their local lake and stream which made the study more interesting to them because of their connection.

Richard's students started with the article from the eii workshop about problems with overpopulation of deer. They analyzed the problem, issue, characters, and motivations. Following that discussion, they focused on a local environmental topic, that of curbside recycling, an issue in their own hometown. There was heated discussion about the pros and cons. They polled their parents about their feelings and used that information to delve deeper into the issue. "They went home and asked their parents, 'What do you think about curbside recycling?' Tell the pros and cons that we came up with, and you know, they were pretty creative with them, in what they were thinking about with their pros and cons."

Level IV: Responsible Environmental Action

Level IV of the eii instructional model is Responsible Environmental Action. In this level, the teacher and the students chose some sort of action they could take in their school or community that related to the theme. While a variety of ideas are discussed in the workshop, the choice is ultimately left up to the teacher and the students. Some projects were completed within that school year and some were planned for the future.

Projects completed during the school year. Both Amanda and Travis took their students fishing and also sampled the water where they fished. Linda took her students on a full day field trip to a local state park. One of the activities for the day was water sampling. Jason, his students, and parent volunteers went to a local stream and tested the water. Roy and his students planted a prairie garden in a corner of the school playground. Rhonda's students made posters about conserving water and hung them in downtown businesses. Marilyn's students wrote a letter to the editor of the local newspaper about

properly taking care of dog waste. Richard's students cleaned a wooded area on the edge of their school playground and also rejuvenated a prairie garden planted in front of their school.

Alyson's students created signage for the extensive prairie near their school. The signs gave information about prairie wildlife that can be seen throughout the year. They also built and placed bluebird houses in the prairie area. Beverly's students planted trees on the playground.

Projects planned for the future. Because of the flooding in their area and construction taking place around their school, Ashley's students have plans for a prairie garden during the next school year. Ashley also sent home prairie seeds with her students to start their own garden at home.

Travis's students are planning to build a bridge across a wet area that leads to their athletic fields. He also needed to wait until some construction was finished. He will have the same students the following year.

Michelle's students had plans to plant prairie in a wet area near their school, but were not able to complete that project before school ended. She will have some of the same students so plans continued for the next year.

Analyzing the data according to the four levels of the eii instructional model gave further insight into the implementation of the eii instructional model by teachers in their classrooms. In the absence of the eii model in an elementary science classroom, Level II would encompass the entire instruction and learning that would take place. That is by far the largest component of the eii unit, but the addition of the other three levels takes the

learning to another level, allowing for the understanding of environmental problems and issues, the connection to real environmental problems and issues, and the opportunity to take responsible environmental action in their own community. Examining the data established exactly what teachers and their student accomplished in the implementation and also provided the opportunity to see the depth the eii model added to the study of water or wildlife.

CHAPTER 4B

DATA ANALYSIS OF UNIT LESSON PLANS AND CO-TEACHING JOURNALS

Data from Examination of Unit Lesson Plans

To understand more completely the implementation of the eii professional development in their classrooms, I analyzed the unit lesson plans the participating teachers had written and submitted. Through reading and re-reading the lesson plans, I discovered additional details of the implementation that teachers had not shared in the interview sessions. I determined the categories of this data set through the multiple readings of the lesson plans, with the already determined categories of the interview data in mind as a comparison. The resulting categories were similar, but not exactly the same because I viewed the data through a new lens. Data already presented will not be repeated, only unique information I discovered in the unit lesson plans will be described. These categories were included; evidence of the understanding of the four levels of the instructional model, modification details, alignment with content standards, and additional resources as shown in Table 9. Subcategories were also noted. Data are presented in descriptive form by the categories.

Table 9

Lesson Plan Data Category Description

Categories	**Subcategories**	**Category Code**	**Category Description**
Modification Details	Level I Level II Level III Level IV	MOD	Data were coded as modifications if teachers mentioned ways they changed eii workshop lessons or activities.
Additional Resources	Print Electronic Human	RES	Date were coded as additional resources if the teacher described resources that had not been introduced in the eii workshop.
Understanding the Four eii Levels		Not Coded	Evidence from lesson plans that indicated understanding of the four levels
Iowa Core Essential Skills and Concepts	Kindergarten First Grade Second Grade Third Grade Fourth Grade	Not Coded	This data was a separate chart included in lesson plan data indicating standard content areas used in the eii unit.

Understanding the Four eii Instructional Levels

All 15 of the participating teachers structured their lesson plans according to four levels of the eii instructional model. The understanding of this model was key to implementing the eii model with fidelity and it was obvious that all the teachers were cognizant of the structure of the unit. They all included appropriate lessons within the four levels which was another indication of their understanding of the model. All of the teachers based their lessons on the four levels, but none of the teachers taught the lessons and activities exactly as it had been done in the eii workshop. They all made choices and modifications for their own students.

Modification Details

Through their unit lesson plans, teachers shared details of the modifications they made of lessons and activities from the eii workshop when implementing the instructional model in their classrooms. These modifications were structured by the four levels of the eii model. Modifications were discussed previously in the interview data, but additional details were included here.

Level I: What is an environmental issue?

Motivator Vocabulary

Ashley mentioned in the interview that she had modified the motivator vocabulary terms for her first graders, but not the exact modifications. In her lesson plan, she described using these terms: recreation, health, beauty, ecology, business, educational, government, right/wrong, social, and harmful/helpful. The original motivator terms were: aesthetic, cultural, ecological, economic, educational, egocentric,

ethical/moral, ethnocentric, health, political, recreational, religious, and social. She described how she and her students came up with student-friendly definitions for their motivator terms.

Beverly gave her students examples of motivation from her own life. She explained that she was taking graduate classes for several reasons: love of learning, make more money, and meeting and learning from other teachers. Her class offered ideas about why Beverly was motivated to exercise on a regular basis. These examples helped the students understand motivation. Next students gave examples of something they had done and what words described their motivation.

Linda reduced the motivator vocabulary terms to the following: economic, health, social, scientific, educational, aesthetic, moral, ecological, and egocentric. She also modified *The Motivator* sheet by placing those words in large boxes on a sheet of paper. For her kindergartners, she read the words and the students drew pictures of what they thought they meant.

The Lorax

After reading *The* Lorax, Alyson divided her students into two groups, *The Lorax* and the Oncler. Using their assigned roles, the students designed character maps showing the personality profiles of the characters, using evidence from the book. They were asked to switch roles and repeat the assignment. Class discussion followed examining the different points of view. The teacher also had the students write down text-to-self and text-to-world examples. Text-to-self means the student were able to make a personal

connection with the text. Text-to-world means the student was able to make a connection between the text and the world.

An activity used in connection with *The Lorax* was called *Lifted Lorax* statements. Statements were taken from *The Lorax* and the students decided which motivator term they thought was the best fit for the sentence. There were not specific answers, which gave students the opportunity to explain why they chose certain motivator terms. Nancy's students spent a good deal of time debating their choices of the motivator terms matched to the *Lifted Lorax* statements.

Marilyn devised a list of vocabulary from *The Lorax* to explain to her students before reading the book. They discussed how Dr. Seuss made up his own words to make the story more interesting. The words included: grickle-grass, Oncler, lerkim, snuff, gruvvulous glove, whisper-ma-phone, snergelly hose, gluppity-glup, sneary, swomee-swans, truffula trees, brown bar-ba-loots, rippulous, humming fish, tufts, thneed, super-axe-hacker, snarggled, cruffulous croak, and smogulous smoke. She also had her students come up with their own connections to the story and how it related to issues and problems in their school and community.

Beverly's students read *The Lorax* one day and the next day, retold the story. She explained that "it was great to know that the students could tell, in order, what happened in the book." Travis opened the discussion with his students before reading *The Lorax* by posing the question, "What is the difference between a problem and an issue?" He gave his students time to think and write about what they thought the difference was. He spent a class period with his students discussing the differences. They used examples from their

own experiences, like disagreements on the playground. Travis felt this gave them background knowledge before reading *The Lorax*.

Level II: What are the Ecological Concepts?

Properties of Water

Ashley's students wore water molecule headbands that depicted the two atoms of hydrogen and one atom of oxygen while they were playing the water cycle game, *The Incredible Journey*.

Gail read *I Get Wet* (Cobb, 2002) to her students prior to doing various properties of water activities. This book explained very simply the properties of water and was a great introduction to the activities. This title was on a list of resource books given to the participating teachers in the workshop, but not necessarily paired with the water properties activities.

Beverly told her students she was magically turning them into water droplets to play the water cycle game. Some of the comments they made while playing the game included:

- "How long am I going to stay here?"
- "I don't want to be a glacier, I will be stuck here for a long time."
- "Why am I going back to a cloud again?"
- "Why are there so many 'stay' sides on this dice (sic)?"

They wrote out reasons for the path they took as a water molecule in *The Incredible Journey* game. They discussed the reasons with their classmates as they wrote them.

Beverly wrote, “The knowledge they gained from this activity really sunk in with the students. I got a lot of *ah ha moments* from that activity.”

True/False Booklets

Pre-service educators from a nearby college made the True/False booklets about prairie animals and shared them with Alyson’s second graders. The college students were able to assess whether the booklet they had created was appropriate for second graders. This activity sparked the minds of the second graders about prairie animals they wanted to learn about.

Types of Prairies

Nancy’s students created posters for the types of prairies rather than using the charts provided in the eii workshop. They color-coded the posters according to the type of prairie: blue was wet, brown was dry, yellow was mesic, and green was savannah.

Level III: What are the local environmental issues? Alyson started her Level III issue study by asking her students to relate the problems and issues of *The Lorax* to their own community. The students wondered what their community would be like without animals. Alyson and the students went outside and made a food web using the animals they had studied in the unit. They wondered what they could do to provide habitat for the animals in their community. That let them to their Level IV action project, which was described in that section.

Beverly did not provide her students a water issue article for her students like she had experienced in the eii workshop. Instead, she had them research water issues in Iowa. During that research, the students came up with some questions about water, so Beverly

brought in some activities from Level II about amounts of water on Earth, they had not done previously to enhance their understanding of water issues.

Ashley approached Level III with her students by asking her students:

- "How do we contribute to water problems?"
- "How can we reduce pollution and conserve water?"

They read about some recent water problems in their community. The students made personal water meters, took them home and monitored the water use in their own homes. After they brought them back, they made an issue analysis web like they had for *The Lorax*. They noted the players, their motivations, and points of view about water usage. This again led to their environmental action project.

Travis used questioning techniques with his students and discussed local water problems and issues at school and then took that conversation home. Most of his students live on farms and they talked about how they could politely discuss water problems and issues at home without putting all the blame on the farmers. When the students shared about the discussions at home, most reported that their parents agreed there is a problem with water quality and there were actions they could take for improvement. The two problems mentioned most often were nitrogen pollution and erosion. Travis reported a statement by one of his students: "Farmers are spending money on fertilizers, which help our crops grow, but also pollute the water, so basically we are buying pollution."

Level IV: What responsible environmental action was taken? Alyson mentioned in her interview about establishing signage in the prairie by their school, but she described a couple other actions her students took in her lesson plan. Those included the

adoption of a prairie as a clean-up project and clean-up of a nearby apartment complex on a regular basis.

Ashley described several environmental actions in her lesson plans:

- Made a checklist to conserve water at home
- Put poems, skits, mottos, and songs on their Facebook page
- Created informational brochures to give to parents and relatives
- Made water conservation posters hung at school, home, and businesses

Gail's students also made a list of ways they used water every day and how they could conserve water. They also listed ideas of how they could keep pollution out of rivers and streams.

Alignment with content standards. Teachers in Iowa are required to align their teaching and student learning with the *Iowa Core Essential Skills and Concepts*. With the materials provided in the eii workshop was a chart for teachers to signify how they aligned what they did in this unit with the required content standards. Table 10 indicates by grade level, the standard content areas used in the units.

Table 10

Alignment of Standards and Content Areas from Lesson Plans

Grade Level	**Standard Source**	**Content Areas**
Kindergarten	Iowa Core Essential Skills and Concepts	Literacy Science
First Grade	Iowa Core Essential Skills and Concepts	Literacy Science Social Studies 21st Century Skills
Second Grade	Iowa Core Essential Skills and Concepts	Literacy Science Math Social Studies 21st Century Skills
Third Grade	Iowa Core Essential Skills and Concepts	Literacy Science Math Social Studies 21st Century Skills
Fourth Grade	Iowa Core Essential Skills and Concepts	Literacy Science Math Social Studies 21st Century Skills

Additional resources. Teachers mentioned additional resources in their lesson plans they had not mentioned in the interviews. Subcategories were print, electronic, and human.

Print

Ashley used *McElligot's Pool* (1947) by Dr. Seuss to introduce the water unit to her students. She also used *Water's Way* by Lisa Peters (1993) as she and her students discussed and charted where water was found.

Electronic

Alyson used an electronic resource found on the Internet from Iowa State University to research prairie animals. Because it was an Iowa resource, it was especially helpful in finding descriptions of the prairie animals.

Ashley showed her students a DVD entitled, *Bill Nye the Science Guy: Pollution Solutions* (2008) to review concepts about natural resources, water use, sources of water, and water pollution. She also used the *Water Match* game from the Project Wet Curriculum (2015). Additionally, she found a simple cut and paste water cycle chart called, *Round and Round the Water Cycle* (Dublin San Ramon Services District, 2015) that she used with her students.

Human

Alyson invited a naturalist from the nearby nature center to talk to her students. "She spoke about plant parts and why water is so important to plants and to us, reinforcing our knowledge of the water cycle and how it affects living things."

Data from Co-Teaching Journals

The majority of the data used in this research study was clearly the interview data from the two separate interviews. Additional data from the co-teaching journals I kept resulted in similar categories as the interview data with a few additions and some

deletions. In this study of the implementation of the eii instructional model in elementary classrooms, my co-teaching experiences with the two units with two 4th grade teachers and their students was invaluable. I actively participated in planning and teaching the lessons and activities which gave me great understanding of the capabilities of the students to complete the activities and their level of engagement in the lessons. This co-teaching gave me first-hand experiences of the implementation of the eii model in elementary classrooms. I have presented details of the implementation and highlighted the **categories** of **student engagement, student understanding**, **curriculum connections**, **workshop activities**, **student enjoyment** and **time** as shown in Table 11. To avoid repetition of previous data, I described the activity and indicated which category fit with boldface type. Next, I described the categories of times, outside the classroom, teacher enthusiasm, support, and working with others in separate paragraphs.

Table 11

Co-Teaching Journal Data Categories

Categories	**Codes**	**Description**	Instances
Student Engagement	SE	Reference was made to the engagement of the students in the activity	30
Student Understanding	SU	Reference was made to the students' understanding of the content	21
Curriculum Connections	CC	Reference was made to curriculum connections	15
Workshop Activities and Materials	WA	Reference was made to workshop activities and materials	13
Student Enjoyment	ENJ	Reference was made to the enjoyment of the students in the activity	12
Time	TM	Reference was made to time	12
Outside the Classroom	OC	Reference was made to taking the students outside of the classroom for eii activities	3
Teacher Enthusiasm	TE	Reference was made to the enthusiasm of the teacher	2
Support	SP	Reference was made to support for the eii program implementation	1
Working With Others	WO	Reference was made to working with other teachers	1

Level I: What is an environmental issue? In both groups we began the unit with a discussion about motivation, a **workshop activity** we used to begin both of the environmental studies. What motivates people to do what they do? The students were given the motivator pictures with no words and asked to label them with words they thought identified the pictures. The students had no problems as they labeled the pictures

and **engaged** in discussion about motivation. The next **workshop activity** in which the students were actively **engaged** was acting out *The Lorax*. I brought a tub of *Lorax* props and multiple copies of the books that we used with both groups of fourth graders. Everyone was assigned a part and a prop and we read the book orally together. This ensured that everyone had a part and could read along with the group. After we acted out the book, we discussed the players, their points of view, and their motivations as students filled a booklet specifically designed to analyze the story in the light of environmental problems and environmental issues. We distinguished between an environmental problem and an environmental issue. The students were quite **engaged** as they flipped through the pages of *The Lorax* looking for evidence to support their answers and demonstrated their **understanding** of problems and issues by filling out the booklets and through discussion. Using a fictional storybook like this gave them background with a story that clearly had two sides, two points of view, and was easily analyzed. This analysis of *The Lorax* set the stage for **understanding** real environmental issues in Level III of the instructional model.

With one of the groups, we had a great **engaging** discussion about whether the Oncler was a good guy or a bad guy. The students at first thought he was a bad guy, but the more they thought about it, decided that he also had the right to cut down the trees. He owned the land, had his own factory, and provided employment for quite a few people. This was the first step in **understanding** someone else's point of view in issues.

In the next **workshop activity**, the students labeled statements taken from *The Lorax* with the motivator terms. We used any suggestion from the students that they

could justify as there are not completely right or wrong answers for this activity. The students thought about and demonstrated **understanding** of motivation.

Level II: What are the ecological concepts? Level II included science **curriculum** concepts the students needed to understand in order to further their study of the environmental topic. The first **workshop activity** for both groups was learning the vocabulary for the environmental topic. We repeated the method we had used in the eii workshop of posting the terms with definitions in no special order around the room. The students were given cards on a metal ring with just the definition and they had to find and add the term. The students were very **engaged** in this activity and labeled the definitions with the correct terms. The students **enjoyed** this activity as evidenced by a student that commented to me that he felt like a detective. This was a great literacy **curriculum connection** in learning vocabulary.

The two co-teaching experiences were based on two different topics, so the following science content activities were presented separately.

Wildlife of Prairie Roadsides

The students read the poem, *Where the Sidewalk Ends*, by Shel Silverstein (2014) and illustrated their ideas. In this **workshop activity** the students illustrated and explained their ideas of what they saw beyond their sidewalk. On the back of their illustrations, the students labeled the items either biotic or abiotic. The students were very **engaged** and **enjoyed** sharing their thoughts and illustrations.

The students watched a DVD called, *Tallgrass Prairie Revival*, produced and distributed by the Iowa Department of Transportation for the next **workshop activity**.

This movie told the story of prairies in Iowa from the time Iowa was completely covered with prairie to the present. I prepared and asked the students the following questions following the movie:

- What does a prairie look like?
- What animals live in the prairie?
- What happened to the prairie in Iowa?
- What are we doing to reestablish prairies in Iowa?
- What are some of the benefits of native plantings?

The students were **engaged** in a lively discussion. They were particularly interested in and **enjoyed** learning about prairie chickens and buffalo that we do not see in Iowa today. They demonstrated **understanding** that we do not have much prairie today because it has been plowed up for farmland. We discussed whether that was bad or good. The students were able to relate their thoughts back to the motivator discussion about *The Lorax*.

Another **workshop activity** in which the students were actively **engaged** was the True/False booklets about prairie animals. They each researched a prairie animal and wrote statements that were either true or false about that animal and used the information to make a booklet. As a prelude to the activity, the students read similar texts published by Scholastic. Students used both print and electronic resources in their research. They were very **engaged** and produced their own booklets. The students thoroughly enjoyed the sharing session, as they tried to trick their classmates with their true and false

statements about their animals. There was a great literacy **curriculum connection** as the students used informational resources to create the booklets.

The next **workshop activity** in which the students were **engaged** was a discussion about pollinators. We watched a short video displaying pollination through some phenomenal camera work called *The Beauty of Pollination* (2015). After watching the video we read a book together entitled, *What if There Were No Bees?*, by Suzanne Slade (2010). The students were quite **engaged** in the text and especially liked the boxes on each set of pages called, *It's Critical*, that gave specific information about bees. Their discussion demonstrated the **understanding** of the importance of bees and pollination in our lives and what the world would be like without bees.

Preserving and Protecting Our Water Resources

There were numerous activities and lessons in which the students were actively **engaged** in the second co-teaching as well as the first. The first **workshop activity** in which the students were actively **engaged** was about the amount fresh water available for us to use on Earth. First, they were given a graph and asked to guess the percentage of fresh water, salt water, and glacial ice on Earth. After they had recorded their guesses, we read p. 7 of the book, *One Well: The Story of Water on Earth*, by Strauss and Woods (2007), that talked about our watery planet. They used the actual percentages from the book to compare with their predictions. The percentages were broken up into smaller categories than the three original ones, so they had to decide whether the new categories were fresh water, salt water, or glacial ice and figure the percentages from there. They

were very interested in discovering we can only use 1% of the water on Earth for drinking purposes.

The next **engaging** activity was figuring out the percentage of water and land on our Earth. We did this by tossing an inflatable globe and the students recorded on a tally sheet where their left pinky landed. They tossed it 20 times and then had to figure out their results from that data. They had been discussing percentages and fractions in math, so they were quite **engaged** in finding the answer and it was a great math **curriculum connection**. Their **understanding** of the math concept as well as the amount of water and land on Earth was evident by their graphs.

The Incredible Journey water cycle game was the next **engaging workshop activity**. The students played the part of a water droplet and tossed a cube that determined their travel to plants, animals, oceans, lakes, rivers, glaciers, and clouds. The students kept a log of the places they landed and created a bead necklace that indicated their paths. Afterwards they wrote a story from the point of view of the water droplet. Their creative stories indicated their **understanding** of the water cycle. The laughter and discussion during the water cycle game was a great indication of their **enjoyment** and **engagement**.

The next **workshop activity** was one we had done in the eii workshop, but none of the other teachers interviewed talked about using it in their classrooms. It was a water properties puzzle. It was time consuming to print off and cut apart. It was best printed in color, so teachers may have decided not to do it. I was very interested in how these fourth graders would do with the puzzle. They first worked alone and then with a partner before

our class discussion. We accepted their answers as long as they could defend them which demonstrated their **understanding** of the water properties. They were very **engaged** and discovered two concepts they were not familiar with, diffusion and density. Those were two water properties that we had not learned about yet, so it made perfect sense. Those were two concepts we planned to do in the next session.

We dedicated an entire day to a **workshop activity** in which the students designed, built, and tested their own water filtration systems. This was one of the best activities I have ever done with students in my years of teaching. They were **engaged** in the entire process of building something from plastic water bottles to filter water. They demonstrated **understanding** of the engineering process. A complete explanation of this activity was published in *Science and Children* (Ehlers & Coughlin, February, 2015).

Level III: What are local environmental issues? Next, I described how the students delved into real environmental issues based on the two environmental topics.

Wildlife of Prairie Roadsides

The first issue we discussed for this theme was based on the vast amounts of deer in Iowa and what might be solutions to this environmental issue. In this **workshop activity**, the students read a newspaper article from the Waterloo Courier entitled, *Deer debate: Panel mulls how — or if — Iowa Should Control Whitetail Numbers*, by Dennis Magee (2008). They were quite **engaged** during the reading of the article together and highlighted the names of the people involved in the debate. They related this analysis back to *The Lorax* which indicated their **understanding** of problems, issues and motivation. They were assigned one of the names from the article and wrote their points

of view of what should be done with the deer population in Iowa. A lively debate ensued as they shared their points of view with their classmates. They **enjoyed** playing the part of one of the characters. The students were able to relate to a real environmental issue like this that was close to home.

The next issue was an **additional activity** the teacher wanted to discuss as it related to the city in which the students lived. This city did not have curbside recycling. First the class made a list on the whiteboard of pros and cons of curbside recycling. They really **understood** the issue and came up with an impressive list. That night they asked their parents' point of view about curbside recycling. Many of the parents were most interested in the cost, but were still interested in the environmental benefits. They would rather drive to a recycling bin for no cost rather than pay a fee for curbside recycling. The students **understood** and looked at this issue from more than one angle and thought about the motivations of those involved.

Preserving and Protecting Our Water Resources

We used news articles about water quality in Iowa and the book, *Riparia's River* (2011) and analyzed real environmental issues. The students read the articles and filled out a chart indicating the individuals in the readings, their points of view, and their motivations. The teacher and I were quite amazed at the connections the students made between those articles and the fictional storybook. They really **understood** why the people in the articles and story believed what they did. They noted both the problems and the issues. This was a great tie to the **curriculum** as one of the Iowa Core literacy

standards states, “Integrate information from two texts on the same topic in order to write about it knowledgeably” (Iowa Department of Education, 2011).

Level IV: Responsible environmental action.

Wildlife of Prairie Roadsides

We brainstormed a list of possible actions related to the topic. The students were quite **engaged** as they created a long list of ideas to take responsible environmental action. Their **excitement** to do something was evident. **Time** was a problem as the school year near the end, so we needed a plan that could be carried out within two weeks. We decided to do a trash cleanup of the woods adjacent to the playground and performed some maintenance of the prairie garden in front of the school. Many of the students commented about the amount of trash they picked up in the woods and declared they would never litter again.

Preserving and Protecting Our Water Resources

The action plan for this class included a field trip to a local pond to fish. A nearby naturalist brought fishing poles and some local fishing enthusiasts helped the students. I prepared for no luck at catching fish, but I was wrong. Almost every student caught at least one, and many caught several. While there, the students also picked up trash from the area and collected water samples they analyzed upon returning to the classroom. To say that the students were **excited** about catching fish was an understatement. The students **understood** the results of the water sampling and related it to the fish they caught. They made generalizations about the water quality even before they tested it. They knew it wasn’t horrible because there were many fish in the pond. The testing of the

water verified that the water was of good quality. Some of the students suggested we should test the water in the nearby river as they thought it might not be as good.

Other journal entry information. Some of the coded categories were mentioned only a few times, but that did not diminish the importance. My entries centered mostly on observing how the students were involved in the lessons and activities of the unit. Those have been described, but I wished to elaborate on other thoughts from my co-teaching experiences.

Time

The **time** factor was quite different in the two experiences. In the first co-teaching experience, I came for an hour right before lunch, so there was no possibility of extending that time. We always ran out of time, but the teacher gave the students study time at the end of the day to finish any activities, which meant I missed some of it, as I had to return to the university to teach classes. It was still a great experience and the students were always excited to take on another activity. They were also anxious to show me projects they had completed in my absence.

In the second co-teaching experience, our schedule was totally different. We dedicated an entire day to the lessons and activities for this topic. The teacher and her students called it *Sciencepalooza*. The students viewed our Wednesday's filled with science activities as a holiday. Having **time** to completely design, build, and test the water filtration devices in one day was wonderful. The students cheered when I would arrive with the materials for our day's activities. It was obvious they enjoyed the learning.

We included all the content areas of reading, math, science, and social studies in an interdisciplinary manner, even though the focus was on the environmental topic.

Outside the Classroom

Going outside the classroom was included in the action plan for both of these groups. The students experienced their impact on the environment as they cleaned up trash, tested water, and tended to prairie plants. The ultimate goal of this instructional model was to encourage young people to care about the environment. The students in these two classes were given the opportunity to learn how to actively do this.

Teacher Enthusiasm

Both teachers I worked with were very enthusiastic about the implementation of the eii unit. Both had attended more than one eii workshop and fully understood the four levels of the model. They were comfortable modifying their normal instruction and routines to implement the eii unit into their curriculum.

Support

Prior to the start of the eii co-teaching experience, I spoke with principals of both schools to make sure they were informed of this endeavor. Both were very supportive and visited the classrooms during implementation in the classrooms.

Working with Others

Both teachers commented how great it was to experience the co-teaching of the model. I prepared the booklets, brought multiple copies of books, and brought materials for the lessons and activities which took the burden of preparation off the teachers. We worked together when students were doing activities such as: researching for the

True/False booklets, making density tubes, creating the water filtration devices, and testing the water.

Through Another Lens: Teacher Enthusiasm and Interdisciplinary Learning

After analyzing the three types of data, I realized the prevalence of both teacher enthusiasm and interdisciplinary teaching and learning throughout the data. As I examined the teacher interview data once again through that lens, I searched for connections between those two categories. I developed Table 12 in which I identified instances 28 when teachers expressed enthusiasm connected with the interdisciplinary aspect of the teaching of the eii unit in their classrooms.

Table 12. Teacher Enthusiasm and Interdisciplinary Teaching and Learning

Teacher Enthusiasm	**Interdisciplinary Teaching and Learning**
The principal noticed the curricular ties	Literacy and water study
Science Writing Heuristics	Writing and researching about water
Acting out the Lorax	Environmental issues and playground issues Reading and Science
The students had learned lot of facts about water	Reading and studying about water
The Water Cycle Song	Science and Music
Tying the lessons together	Literacy and Science Standards
Fitting into the curriculum	Literacy and Science
Reading the roots books and graphed roots	Reading, Math, and Science
Wonderful literature by Jean Craighead George	Learning science concepts while reading
The true-false booklets	Reading, researching about animals
Acting out the Lorax	Learning environmental issues through literature
Reading issues articles	Learning environmental issues through articles
Created 3-D water cycle charts	Mixed creative arts and science
Use of iPads in lesson with macro-invertebrates	Technology, Reading, and Science
Figuring water usage	Reading, Math, and Science
Connections with environmental issues and articles	Reading and Science
Journaling about their animals	Reading, writing and science
The water filtration	Engineering, drawing, writing, reading, science
Fishing connections	Science, reading, math
Merging Iowa study and water quality	Science and social studies
Taking sides with issues	Reading and science
Native American study-reliance on water	Social studies and science
True/False booklets	Math, Reading, Science
Deer issue article	Reading and Science
Put up prairie signs	Reading and Science
The Motivator Vocabulary	Reading and Science
The Water Cycle	Vocabulary and Science
The whole unit	Math, literacy, science

This concluded the data analysis of the interview data, the unit lesson plan data, and data from the co-teaching journals. The comparison of the three types of descriptive data provided me evidence to develop the following themes based on the research questions.

Themes Derived from the Data Aligned with Research Questions

After analyzing the data from teacher interviews, co-teaching journals, and the unit lesson plans, I developed the following themes, aligned with the research questions.

1. How did elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?

Theme 1. The elementary teachers embraced change and personalized the implementation of the eii instructional model in their own classrooms.

In the analysis of the data the teachers demonstrated tremendous effort in the implementation of the eii unit in their classrooms. Teachers involved in the study shared rich detail of how they implemented the unit lessons and activities in their classrooms. The teachers' understanding of the content required to teach the unit was evident through their explanations of implementation. They chose numerous activities and lessons to help their students understand and learn the content necessary to comprehend the environmental issue. The teachers described the use of instructional strategies that engaged the students in the learning just as they had experienced in the eii workshop. Modifications were made to fit the needs of their students and to make the learning more engaging and exciting. The teachers demonstrated a thorough understanding of the eii

instructional model in the implementation with their students. They embraced the use of an environmental issue theme to teach and learn in an interdisciplinary manner. The teachers understood the eii model and implemented it to teach the environmental theme in their classrooms to empower their students to become responsible citizens and care for their environment. The use of this instructional model by the teachers also empowered them to teach in new ways using engaging instructional methods and a deeper understanding of the content. Throughout the analysis of the data, the excitement and enthusiasm of the teachers was evident as well as the interdisciplinary implementation. The description of exactly how the teachers implemented the activities and lessons of the eii instructional model was presented in detail through the interviews, co-teaching journals, and the unit lesson plans.

2. Why did elementary teachers modify lessons and activities when implementing the environmental issues unit in their classrooms?

Theme 2. Teachers modified the eii lessons and activities to actively engage the students in the learning and to fit their cognitive levels.

The teachers were actively engaged in the learning during the eii workshop. The eii instructional team purposely models and involves the teacher participants in the lessons and activities in the workshop sessions. The teachers described the same method of engaged learning with their students. They wanted their students to be as excited and enthusiastic about the learning as they had been. The teachers were able to choose the activities they wished to use with their students to teach about the environmental issue.

This required them to make modifications of the lessons and activities to fit the cognitive levels of their own students.

The modifications of the lessons and activities are described in the modification category section in the rank order of the interview data analysis as well as the four levels of the instructional model in both the interview data and the unit lesson plan data. Teachers modified the lessons and activities in many ways and for these reasons; student ability, time, and helping students understand concepts. They also wanted their students to be excited and enthusiastic about the learning. The modification of the lessons and activities empowered both the teachers and their students.

3. What effect did the eii professional development experience have on the participating teachers?

Theme 3. Teachers were empowered and enthusiastic about the implementation of the eii model.

The teachers expressed great passion about teaching the unit and a general feeling of excitement and empowerment. They described the lessons and activities they chose to use with their students and the modifications with excitement and enthusiasm. The teachers also emphasized the engagement and enjoyment of the students in the learning.

The overarching theme. An overarching theme I developed through the analysis of the implementation data was **Teacher Empowerment**. The teachers in this study exhibited empowerment in their explanations of how they implemented the eii unit into their classrooms. Empowerment can be defined as self-actualization to achieve one's potential. The teachers demonstrated a variety of factors supporting this self-actualization

to achieve their potential while implementing this unit in their classrooms. One factor was that the teachers felt confident in the delivery of the unit because they understood the content. Another factor was the teachers used new instructional techniques and strategies that engaged their students in learning. The professional development experience gave them motivation as well as the tools to teach their students in innovative ways using new materials and accessing novel resources. They chose the lessons and activities that they felt were appropriate for their students. The teachers were also comfortable making modifications when they felt necessary. The major categories that supported this theory of **Teacher Empowerment** were Student Engagement, Workshop Activities, Modifications, Teacher Enthusiasm, and Curriculum Connections. Each of these categories included a description of how the empowered teachers implemented what they learned in the professional development experience and what their students experienced as a result of **Teacher Empowerment**. A model describing this overarching theme of teacher empowerment was developed. (see Figure 1)

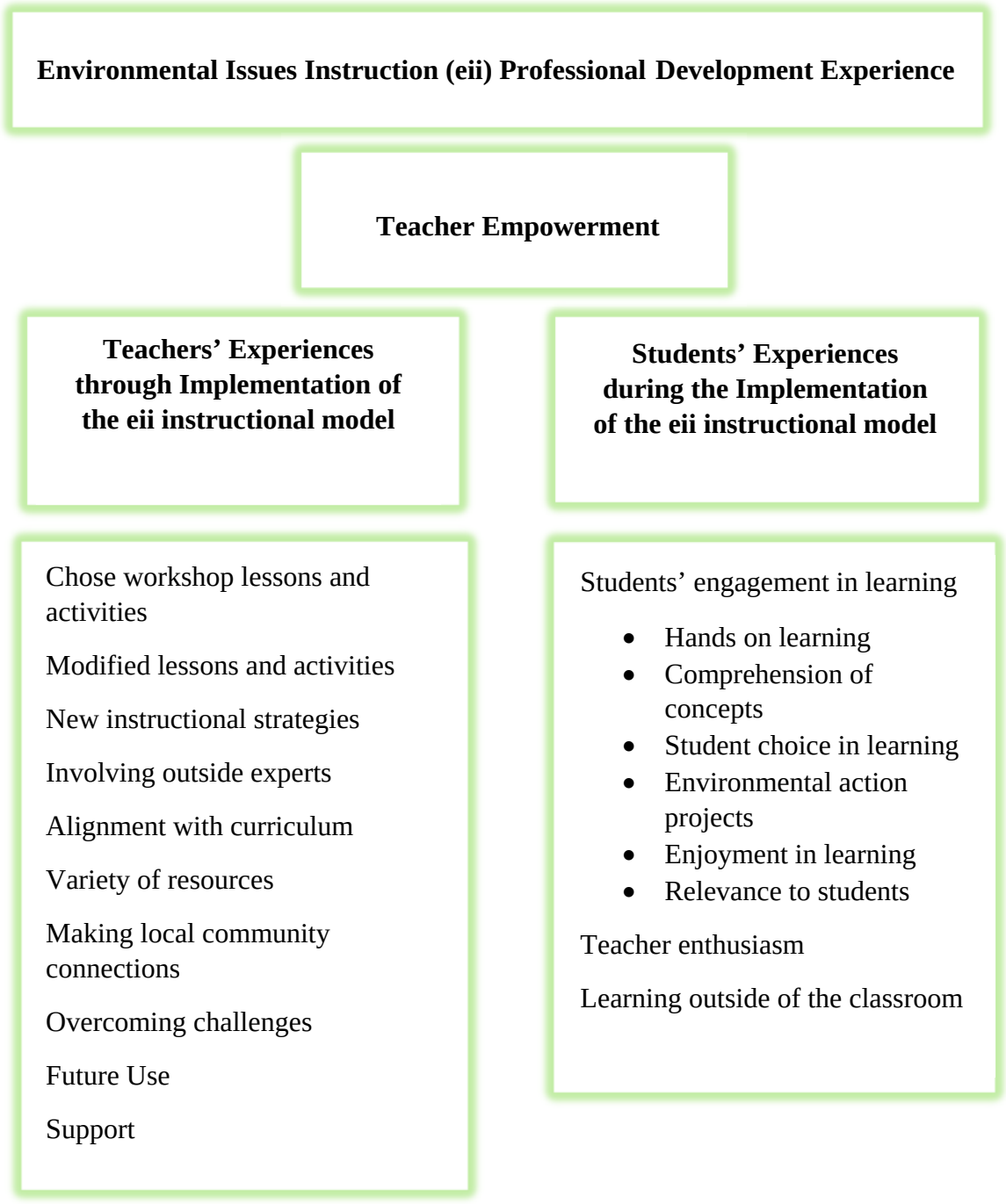

Figure 1. Model of Teacher Empowerment. This figure illustrates the contributing factors to teacher empowerment through the experiences of the participating teachers and their students in the implementation of the eii instructional model.

CHAPTER 5

DISCUSSION

Teacher Empowerment

The purpose of this qualitative study was to examine how elementary teachers implemented the eii instructional model in their classrooms after the professional development experience. The data analysis described in detail exactly how these teachers used the activities, lessons, instructional strategies, tools, and materials.

The overarching theme I developed by the data analysis was labeled **Teacher Empowerment.** As noted in the literature review, empowerment is defined as, ““to enable, to promote the self-actualization of one’s potential” (2015). Through the professional development, the participating teachers were enabled to the self-actualization of their own potential as a teacher. The data provided evidence of how the teachers were also empowered as they implemented the eii theme-based interdisciplinary unit in their classrooms. The many expressions of teacher enthusiasm about the engagement of their students in the activities and lessons provided powerful evidence supporting the idea of teacher empowerment. Studies by Breault, 2013; Patrick, Hisley, and Kempler, 2000; Keller, Goetz, Becker, Morger, and Hensley, 2014; and Overton, 2009 provided support of the importance of enthusiasm and empowerment of teachers to enhance teaching and learning.

Following are the research questions, the correlating themes, and conclusions:

Research Question 1

1. How did elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?

Theme 1. The elementary teachers embraced change and personalized the implementation of the eii instructional model in their own classrooms.

Conclusions:

The teachers put a great deal of effort into the planning and implementation of the lessons and activities they used with their students. During the workshop sessions, the teachers were directed to choose the lessons and activities they had experienced in the workshop and felt were appropriate for the grade level and cognitive level of their students. The teachers in the study felt confident with the content of the environmental issue theme. They felt comfortable in designing the environmental issues unit and choosing the activities, lessons, and instructional methods specifically for the students in their classrooms. They had personally experienced the lessons and activities in the eii workshop and were cognizant of their own engagement and how it had increased their content knowledge of the environmental topic. Zepeda (2013) described this necessary component of adult learning. They embraced the interdisciplinary aspect of the eii instructional model and taught in that manner throughout the unit. They were quite successful incorporating the content into their present curriculum. They were excited and enthusiastic in the delivery and as a result, so were their students.

Research Question 2

2. Why did elementary teachers modify lessons and activities when implementing the environmental issues unit in their classrooms?

Theme 2. Teachers modified the eii lessons and activities to actively engage the students in the learning and to fit their cognitive levels.

Conclusions:

The teachers modified the activities and lessons to enhance the learning for their students. They wanted their students to be as interested, engaged and excited as they were. Modifications were made to the lessons and activities to deepen the learning for the students, so they would learn the content at their own level of understanding. They also modified their own instructional methods in order to engage the students in the learning rather than just deliver content. They taught in a new way. The teachers had experienced an engaged type of learning in the eii workshop experience and employed those methods in their own classrooms.

Research Question 3

3. What effect did the eii professional development experience have on the participating teachers?

Theme 3. Teachers were empowered and enthusiastic about the implementation of the eii model. The teachers exhibited enthusiasm in the comments they made about their implementation of the eii unit in their classrooms. They exhibited empowerment as they described how they chose lessons and activities, planned and delivered the content and the instructional strategies they had learned.

Conclusions:

The participating teachers exhibited empowerment as evidenced by their descriptions of the implementation of the eii environmental unit. Exactly when this empowerment transpired is difficult to discern from the data. The origin of the empowerment may have been during the eii workshop experience, or it may have occurred during the implementation with their students. It may have been a combination of the workshop experience and the implementation, or perhaps a gradual phenomenon. The empowerment may very well be linked to their option to choose the lessons and activities to use with their students. Most professional development experiences do not offer this option of choice for implementation, but the eii professional development does. The origin of the empowerment is probably not exactly the same for any of the teachers, regardless, the teachers felt empowered. Possible reasons for the empowerment:

1. It was the teachers' choice to attend the workshop.
2. The teachers were actively involved in activities and lessons throughout the professional development experience giving them personal experience with the instructional methods.
3. Through the workshop experience, the teachers gained a profound understanding of the content knowledge needed to teach the unit.
4. The teachers received a plethora of instructional ideas, materials, and tools to teach the unit in their own classrooms.
5. The teachers enjoyed learning in the workshop and wanted the same experience for their own students.

6. The teachers had control of the planning and delivery in their own classrooms.

The first factor that contributed to the empowerment of the teachers was that they chose to attend the eii workshop. In the present educational culture of No Child Left Behind, much professional development is forced upon teachers because of their school's status related to standardized test results. They do not have a choice about it. The eii experience was entirely the teacher's choice. They were not required to attend; it was their own desire to improve their professional knowledge and practice that compelled them to do so. Colbert, Brown, Choi, and Thomas' 2008 study of professional development provided evidence to support the value of teachers choosing their own professional development.

> When teachers are empowered to create their own professional growth plan, their passion for teaching and for improving the lives of their students is greatly enhanced. When they are subjected to professional development activities selected by their administration, they are generally not enthusiastic and many times feel there is a disconnect between those activities and what they do in the classroom" (p. 148).

This idea as also supported by Kirkpatrick and Kirkpatrick's (2006) first step in requirements for change associated with professional development. "The person must have the desire to change" (p. 23). The teachers that attended the eii professional development experiences did so because they wanted to, not because it was a requirement.

The second factor that contributed to their sense of empowerment was that they were actively involved in the lessons during the eii workshop. During the eii workshop, they experienced each and every one of the activities they later chose to execute with their students. Adults learn best by doing, just as their students do. Zepeda (2013) provided

support for this type of professional development and outlined principles of adult learning and strategies to engage adult learners (p.47). During the eii professional development workshop, the teachers were actively engaged, given the hands-on opportunities to learn, and connected their learning to their past experiences. They were also asked to apply the new knowledge and skills in their own classrooms.

The third factor to support teacher empowerment was that teachers had control of the planning and delivery in their own classrooms. This aligns with another of Zepeda's (2013) adult learning principles: "Give adult learners as much control as possible over what they learn, and other aspects of the learning experience" (p. 47). Although the teachers were asked to adhere to the four instructional levels of the eii model, they had control over exactly what and how they would carry out the environmental theme in their own classrooms. The data described the many workshop activities they chose to use in their classrooms as well as those that they modified for their students.

The fourth factor that supported the theme of teacher empowerment was they received a plethora of instructional strategies, tools, and materials to carry out their plans to teach the unit to their students. This was evidenced in the data by the description of what and how they implemented the activities from the workshop. The connection between their enthusiasm and the interdisciplinary aspect of the eii unit was described a number of times in the data.

The fifth factor was the teachers enjoyed learning in the workshop and wanted the same experience for their own students. They had found great pleasure in the learning

during the workshop as evidenced by their comments and remarks. By the same token, they wanted a similar learning experience for their students.

The sixth factor was the teachers had control of the planning and delivery in their own classrooms. This was a deliberate component of the eii professional development. The teachers were empowered with the choice of the lessons and activities their students experienced. They were in charge of the learning in their own classrooms. Teachers exhibited evidence of self-efficacy and the belief that they were in charge of the learning of their own learning and that of their students.

Implications of the Study

Effect of Professional Development on Teachers

One implication was the delivery of the professional development had a powerful effect on the teachers as evidenced by their descriptions of implementation. The teachers were actively involved in learning the content and instructional methods to teach the thematic unit. As a result, they gained content knowledge and new instructional strategies to be used in the future with other topics, environmental issues, and students. They learned the content and instructional strategies in the workshop, implemented them with their students, and acquired new knowledge, tools and skills to use for years to come. **Teachers should be actively involved during professional development experiences to maximize the learning of content and instructional practices.**

Teacher's Choice

A second implication centers around the choices teachers were allowed to make before, during, and after the workshop. Initially, it was their choice to attend the eii

workshop. No one was required to attend. During the workshop they experienced a plethora of activities, lessons, and instructional methods and chose which ones they wanted to use with their own students. Finally, they were free to modify lessons and activities for their own students. Choice is not a common practice in professional development models. Examination of the Iowa Department of Education's Iowa Professional Development Model (2009) does not indicate the use of teacher choice in planning or implementation. **Empowering teachers to choose from instructional activities and methods to match the needs of the students in their classrooms should be an integral component of professional development.**

Knowledge and Skills for the Future

Another implication was the participating teachers not only learned how to teach this particular environmental issues unit, but acquired knowledge and skills to use in the future. The ultimate goal of the eii and IEEIA instructional models is to empower students to become responsible citizens that take action to take care of the environment (Hungerford, 1992). In the process, teachers were empowered to teach using new interdisciplinary instructional techniques and became more responsible educators. The new learning may make them more confident in their profession and more willing to take leadership roles in their schools and communities. They may influence other teachers who notice the changes they have made in their instruction. This extrapolation of the learning can be examined in the light of the four levels of the instructional model as shown in Table 13. **Teachers learned science content and interdisciplinary**

instructional methods that may influence them to become more confident in their teaching and take on leadership roles in their schools and communities.

Table 13

Teacher Empowerment Aligned with the Eii Instructional Model

	Eii Workshop: Purpose for teachers	**Eii Implementation: Purpose for students**	**Results of eii Implementation: Empowerment for Teachers**
Level I: What is an environmental issue?	Teachers learn the difference between an environmental problem and an environmental issue and can analyze them in an engaging manner.	Students learn the difference between an environmental problem and an environmental issue and can analyze them in an engaging manner.	Teachers have the skills to use literature to teach students to analyze environmental issues in an engaging manner.
Level II: What ecological content is needed to understand the theme?	Teachers are engaged in learning content and instructional methods to teach the science content needed to study an environmental theme.	Students are engaged in learning science content needed to study an environmental theme.	Teachers experienced instructional methods and strategies to teach science content needed to study an environmental issue in a hands-on, interdisciplinary manner.
Level III: What are local environmental issues?	Teachers learn about local environmental issues and how to analyze them.	Students learn about local environmental issues and how to analyze them.	Teachers have skills to help their students research local issues and take action in their communities.
Level IV: What responsible environmental action will you take?	Teachers learn ideas for responsible environmental action to use with their students.	Teachers and students develop and carry out responsible environmental action in their communities.	Teachers take action in their classrooms to use interdisciplinary instructional methods to engage students in the learning.

K-12 Workshop

A final implication was that the eii approach of offering professional development workshops for K-12 teachers of all grade levels and content areas and allowing teachers to modify the instructional methods, activities, and lessons to fit the needs of their students was successful. The elementary teachers in this study provided evidence to indicate they were very capable of adapting what they had learned in the K-12 workshop for the students in their respective classrooms. **Professional development workshops designed for K-12 teachers of all grade levels and content areas can be successful, especially if they provide teachers the opportunity to make choices and modifications as needed. Making time during the professional development for teachers to discuss their choices and make the modifications could be beneficial.**

Suggestions for Further Research

In the process of drawing conclusions and contemplating the possible implications of this study, ideas began to surface about possible future studies. Those offering and participating in professional development experiences would benefit from research that seeks to answer the following questions:

1. What instructional strategies, lessons and activities are the participants from this study still using five years down the road?
2. Have the teachers from this study taken on leadership roles in their schools or in their communities?
3. Did the teachers in this study have an influence on other teachers in regard to their use of science content and instructional strategies?

4. Have the teachers in this study used the interdisciplinary approach they learned in the professional development for other themes or topics?
5. What are students' reactions to this type of instruction and learning?
6. Do teachers that participate in the eii professional development change personal habits in regard to caring for the environment?

Limitations of the Study

The limitations of this study included the number of participants and the focus on one type of professional development experience. Fifteen elementary teachers were interviewed about their implementation of the eii professional development from two separate eii workshops. Additional studies including more teachers and the implementation from future eii workshops would offer more data about this type of professional development. This study focused only on the implementation of the eii professional development experiences.

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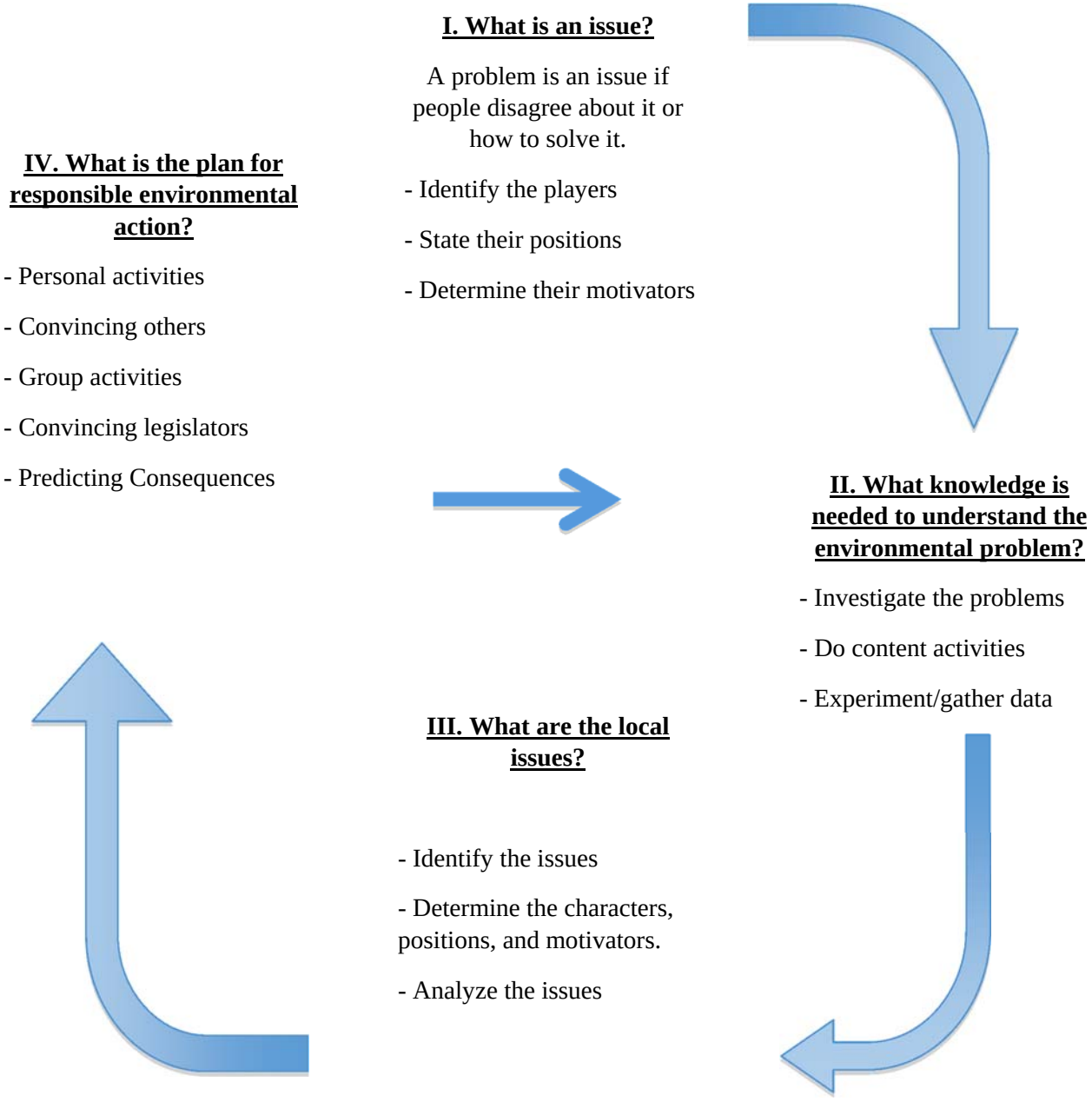
APPENDIX A

Eii MODEL OF ISSUE INVESTIGATION



Based on investigating and Evaluation Environmental Issues and Actions: Skills Development Program by Harold R. Hungerford et al. Stipes Publishing, Champaign, IL.

APPENDIX B

EMAIL SCRIPT

Email script sent prior to workshop sharing session including specific research study information form.

Dear Workshop Participant,
I am looking forward to seeing you at our upcoming environmental issues instruction update session on April 5-6, 2013 at the Pleasant Hill Sleep Inn, April 26-27, 2013 at the Mt. Vernon Sleep Inn or April 4-5, 2014 at the Pleasant Hill Sleep Inn, or April 25-26, 2014 at the Mt. Vernon Sleep Inn. At this session, you will be sharing what you have done with your students in the context of the four-level teaching model you experienced in the initial professional development session.
Through my doctoral studies at the University of Northern Iowa, I am doing research on this type of professional development. At this update session, you will have the option of participating in this research study. Prior to the grade-level sharing on Friday evening, my colleague Julie Delaney will have consent forms for you to sign indicating if you do or do not want to have your data included in my research studies. The consent forms will be placed in a sealed envelope until after your grade has been submitted to the Upper Iowa University Registrar's Office. I will not know whether you have chosen to participate until after your grade is submitted. The sharing session will be recorded with an audio recorder.
An additional aspect of this study entails individual interview sessions about your implementation experience. These interview sessions will be arranged after the workshop at your convenience at a location of your choice, your classroom, your home, or another convenient location. This interview will last from 45 minutes to no more than an hour. This will also be audio recorded.
The following provides pertinent information about the research study:
1) Teachers attend many professional development sessions throughout their academic careers. After these experiences they may or may not implement the strategies, teaching methods, or information they learned. This study will focus on one type of professional development experience, a four-step model of environmental issues instruction. Elementary teachers participating in this specific workshop will share how they implement this teaching model into their curriculum when they return to their classrooms. This research will:

- Examine how elementary teachers implement each level of the environmental issues instruction model in their classrooms.
- Identify the successful and challenging components of implementation.
- Search for common themes in their responses

2) The questions to be addressed are:

- How do elementary teachers implement the environmental issues instruction model in their classrooms after attending the professional development experience?
- What modifications did elementary teachers make to workshop activities?
- What components are most successful?
- What components are most challenging?

3) The results of this study will be used to understand more fully how teachers implement professional development in their classrooms. The information will be used to improve the environmental issues instruction workshops. The results will be disseminated in, Green Teacher, the Journal of Environmental Education, The Iowa Science Teachers Section Conference, The Iowa Academy of Science, The Iowa Conservation Education Coalition's Winter Solstice, Midwest Environmental Education Conference, and The North American Association of Environmental Education Conference. Data from this study may be used in further studies about the successes and challenges of this teaching model.
If you have further questions about the study, my contact information is found in the signature line of this email.

Thanks,

Barbara Ehlers
Assistant Professor of Education
eii Director
Upper Iowa University
605 Washington St.
Fayette, Iowa 52142
ehlersb@uiu.edu
563-425-5322 (office)

APPENDIX C

CONSENT FORM

This is the consent form signed by teacher participants.

UNI IRB Informed Consent Form

Study description and purpose:

This **research** study is being conducted by Barbara Ehlers in correlation with her doctoral studies at the **University of Northern Iowa** of Cedar Falls, Iowa. Teachers attend many professional development sessions throughout their academic careers. After these experiences they may or may not implement the strategies, teaching methods, or information they learned. This study will focus on one type of professional development experience, a four-step model of environmental issues instruction. Elementary teachers participating in this specific workshop will share how they implement this teaching model into their curriculum when they return to their classrooms. This research will:

- Examine how elementary teachers implement each level of the environmental issues instruction model in their classrooms.
- Identify the successful and challenging components of implementation.
- Search for common themes in their responses

The questions to be addressed are:

- To what degree do elementary teachers incorporate the environmental issues instructional model in their classrooms after attending the professional development experience?
- What modifications do elementary teachers make when implementing the environmental issues unit in their classrooms?

Duration of Participation

The participant will be asked to consent to the use of their recorded data provided in the sharing session at the update session on April 5-6, 2013, or April 4-5, 2014 at Pleasant Hill, Iowa or April 26-27, 2013, or April 25-26, 2014 at Mt. Vernon, Iowa. They are also asked to be involved in an individual interview after the workshop session at a date, time, and location convenient to the participant. This 45-60 minute interview will also be recorded and must take place prior to April 1, 2015.The duration of the participant is not to exceed April 1, 2013-March 31, 2015.

Procedure Description

During the sharing portion of the update session, the researcher will record the explanation by the elementary teachers of their implementation of the research model in their classrooms. This is a regular component of the update session of this workshop. The only difference will be in the audio recording of the session. Participants will be asked to share using the format of the four-step model. See **Appendix A** for the model.

The individual interview sessions will take place after the update workshop. The interviewee will be contacted by the researcher to set up a time, place, and date for the 45-60 minute interview. The questions will again mirror the four-level format of the model and be audio recorded.

Grading for the Participants

The participant's grade for this graduate level professional development will not be affected by participation in the research study. The researcher will not know who has consented and who has not until after grades are submitted.

Risks

The risk involved in this study would be minimal. Teachers may experience some discomfort sharing exactly what happened in their classrooms, especially if they did not fully implement the model. The researcher will treat all teachers in a professional manner and respect what they have done with their students in their classrooms. No judgmental comments will be made by researcher.

Benefits

The teachers have the opportunity to share what they and their students have gained from the professional development opportunity. Sharing will help validate what they are doing with other educational professionals. During the sharing session, they also hear what other teachers have done, which may give them new ideas for their own classroom.

Compensation

All participants that consent to participating in this research study will receive a $25 gift card to Amazon. They will receive the gift card after the individual interview session.

Alternatives

Alternative procedures do not apply to this study.

Confidentiality

All identifying information of the participant will be kept in a locked file cabinet in the researcher's Upper Iowa University academic office. The office is also locked when the researcher is not present. Confidentiality will be maintained for the participants.

Right to refuse or withdraw

Participation in this research study is **voluntary.** The participant may refuse to participate or may discontinue participation at any time during the project without penalty or loss of benefits to which the participant is otherwise entitled.

Whom to Contact

Please contact Barbara Ehlers, (PI) Assistant Professor Education, Upper Iowa University with **questions about the research**: ehlersb@uiu.edu, 563-425-5322, or Faculty Advisors, Dr. Karla Krueger at karla.krueger@uni.edu or Dr. Jody Stone at jody.stone@uni.edu.

If the participant has questions about the **research participant's rights**, please contact Anita Gordon, UNI IRB Administrator, 319-273-6148, anita.gordon@uni.edu.

In the **event of a research-related injury,** contact Barbara Ehlers using the information given above.

I agree to participate in the research study as described.

_____	_____	
Printed Name	**Signature**	**Date**

I do not wish to participate in the research study as described.

_____	_____	
Printed Name	**Signature**	**Date**

All participants will receive a copy of this agreement.

APPENDIX D

SAMPLE OF CODED INTERVIEW

Erin: Okay, we'll start with, this is Amanda, um, fourth grade.

Alright, let's start with Level One, and she is going to talk through what we did and what went well and challenges.

Amanda: Well, I think the kids, you know, from all of the years that these guys have read *The Lorax* and have heard *The Lorax*, I don't think they've actually ever taken a literary look at *The Lorax* like we did in class. Having them read it out loud and act out the parts brought the whole story home for them, and then when we started to look at the different pieces of it when we started to kind of break the story down, I think the kids left with a better understanding of the message that's within *The Lorax*. And just a side note, when they took to kindergarten and did the acting out with all of your props, which I wish I had in a closet, they enjoyed doing that and were able to explain to the kindergarteners what the message was of the Lorax after they did the play for the kindergarten kids.

CC

WA

MOD

Erin: Mmm, hmm.

Amanda: So, um, Level One was also the issue, no…

Erin and Amanda: Motivators!

Amanda: The motivator bank, when we first started that activity, I was thinking, *Oh! They're not going to get this!* But I was remembering what the second graders, because I did the whole process with second graders last year, and they didn't understand the motivator bank. They, you know, that was really hard for them to get around. So I was able to see that um…by the time they get to fourth grade, they can understand those motivators. They were coming up, I thought, with great illustrations as to what each one of those motivators were. And they referred back to those quite often, not only in science but also in literature when we talked about character and why characters do what they did within the books that they were reading. They were referred back to, so, I thought that was a rich lesson for them.

SE

SE

SE

SE

Erin: Alright. And then the analysis of issue versus problem.

Amanda: Um, you know, I still, I mean, myself, I struggle with issue versus problem, because every issue is a

problem? Does that make sense? But I think *you* did a great job of explaining how different an issue is from a problem. And I think the kids left knowing the difference and could disseminate the difference. I think later on, simply, I think we ran out of time. I wish we had another day, maybe at least another day, so instead of five weeks have six Wednesdays, I think we would have been able to, like, come back to that, and see where they were.

SE

TM

Erin: Mmm, hmm.

Amanda: But the survey results I thought were favorable for kids knowing the differences between an issue and a problem.

SE

Erin: Mmm, hmm.

Amanda: So they left feeling as though they'd understand, where obviously in the beginning there were a lot of, you know, "I don't even know what this is all about," so I think that was a valuable piece of data, too.

Erin: Okay. Um, okay, then, do you think that's pretty well Level One?

Amanda: I think so. I think, gosh, I should have my binder in front of me right now.

Erin: I thought about that, too. Like, sometimes I just want to see what we remembered because I think that's probably, you know—

Amanda: Yeah.

Erin: What's really, um, first in our minds.

Amanda: Yeah.

Erin: Okay! Then let's talk about Level Two, which is the science concepts, ecological foundations.

Amanda: Yep. The one thing that sticks out still is the Water Cycle game. Not only with the kids leaving with a water cycle bead, but just the whole idea that the journey of a water drop, the Water Cycle game where they were stuck in the ocean. I mean, like, almost everybody in the class was stuck in the ocean. I'm paring

WA

SE

APPENDIX E

SAMPLE CODING SHEET

Pseudony	Grade	WM	Line #	MOD	Line #	TM	Line #	CC	Line #	WA	Line #
Linda	Kindergarten			74-going t	74, 90					58-he did	58, 63, 72
Beverly	TAG	261-Oh, I	261	109-I had	109, 126, 1	139-So thi	139, 278,	518-my m	518	106-The W	106, 172,
Marilyn	2nd			127-did a	127, 135,	156-that t	156			65-we did	65, 100,
Alyson	2nd			105-a hum	105, 186,			251-works	251, 261	111-That v	111
Amanda	4th			137we di	137, 153,	1276-we v	1276,	71-the kid	71, 84,90,	64one tha	64, 76, 120
Connie	2nd			95-did the	95			82-that w	82, 86,	88-made t	88, 90, 97,
Jason	TAG			66-main t	66, 82	98-becaus	98			63-so we	63, 78
Ashley	1st			43-watche	43, 44, 62, 69, 103,126, 163					39-did the	39, 158
Rhonda	2nd			217-heari	217, 219, 2	369-runni	369			214-the In	214, 312, 3