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# Student-teacher Interaction Through Online Reflective Journals in a High School Science Classroom: What Have We Learned?

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Student-teacher Interaction Through Online Reflective Journals  
in a High School Science Classroom: What Have We Learned?

by

Megan E. Ehlers

A dissertation submitted in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
Department of Science Education  
College of Education  
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## TABLE OF CONTENTS

LIST OF TABLES.....	iii
LIST OF FIGURES.....	iv
ABSTRACT.....	v
CHAPTER ONE: INTRODUCTION.....	1
Statement of the Problem .....	1
Rationale for the Study.....	2
Need for the Study.....	5
Purpose of the Study.....	5
Development of the Investigator’s Perceptual Screen.....	6
Summary.....	10
CHAPTER TWO: REVIEW OF THE LITERATURE .....	11
Theoretical Framework.....	11
Integration of Technology.....	12
History of online learning .....	12
Online learning in the formal classroom .....	14
Online journaling.....	16
Reading and Writing .....	18
Standards.....	18
Science literacy .....	19
Differentiated Instruction .....	22
Summary.....	26
CHAPTER THREE: METHODOLOGY.....	28
Purpose of the Study.....	28
Research Design.....	28
Respondents .....	29
Curriculum.....	29
Innovation: Design of Online Journals .....	31
Data Collection.....	34
Qualitative Data Analysis .....	34

Summary .....	35
CHAPTER FOUR: ANALYSIS AND FINDINGS .....	36
Categorization of Qualitative Data .....	37
Journal Findings .....	37
Journal 1: Marine Physiology .....	42
Journal 2: Aquaculture .....	45
Journal 3: Human Impact .....	46
Journal 4: Ecotourism .....	50
Journal 5: Final Project .....	51
Affective Domain .....	57
Benefits to Students .....	58
Benefits to the Teacher .....	59
Summary .....	61
CHAPTER FIVE: CONCLUSION .....	62
Summary of Study .....	62
Conclusion .....	63
Dissemination .....	64
Limitations and Future Directions .....	64
REFERENCES .....	66
APPENDIX A: IRB APPROVAL .....	75

## LIST OF TABLES

Table 1: Online journal characteristics .....	33
Table 2: Initial merge of categories .....	38
Table 3: Description of the Depth of Knowledge levels and the affective domain categories in final iteration.....	39
Table 4: Representative journal posts of Web's Depth of Knowledge .....	40

## LIST OF FIGURES

Figure 1: Depiction of the number of misconceptions compared among all five journals.....	42
Figure 2: The graph depicts the Depth of Knowledge categories coded in the Marine Physiology Journal.....	45
Figure 3: Depth of Knowledge levels coded in the Aquaculture Journal.....	46
Figure 4: A comparison of Depth of Knowledge levels among journals.....	49
Figure 5: The Depth of Knowledge levels coded for three differently structured journals.....	56
Figure 6: Number of nodes coded for each journal in the Affective Domain .....	57
Figure 7: Selections coded for background knowledge, internet sources, personal interest, and reflection in all journals.....	58

## **ABSTRACT**

Three challenges in current secondary school science classrooms are (a) meaningful integration of technology, (b) integration of reading and writing in content courses, and (c) differentiation of instruction to meet individual student needs in courses. This is an exploratory study of an urban, high school marine science course in which a teacher added communication with her students via asynchronous online journals. This intervention was intended to enable the teacher to understand how students were constructing knowledge and their understanding of marine science topics. Data included journal postings from all students and the teacher throughout the semester, as well as the teacher's personal journal.



## **CHAPTER ONE:**

### **INTRODUCTION**

#### **Statement of the Problem**

In the last century educational movements have arisen highlighting the importance of application and discovery over memorization in science, coinciding with changes in technology and needs for scientific advancement to compete globally. In 1980, the National Science Teachers Association (NSTA) declared the science/technology/society (STS) movement as a goal of science education in the United States (Yager, 1996). The purpose of the movement was to reform science education, altering it to resemble real scientific practices and making it more relevant to students by linking content to social issues. Spector and Yager (2010) described teaching and learning using STS as learner-centered where the individual actively engages in scientific investigations that require the learner to analyze and to apply information in place of memorization and rote learning.

The STS movement reasoned that the nature of science and technology interactions cannot be satisfied by covering the technological applications present at the end of most textbook chapters, by merely looking at a passage in a textbook, or listening to a lecture. Instead, students must have experience in “doing” science by way of inquiry, application, and discovery. A significant number of high school students will not enter college and for those who do, few will graduate with a degree in science. The goal of science education in K-12

should not be focused primarily on preparation for college or the next course in sequence. STS proposes teaching to prepare students with the tools to look critically at situations, helping them to make complex scientific, social, and political decisions (Spector & Yager, 2010).

Regardless of the clear path set forth by the pioneers of STS decades earlier, the need continues for the science and education community to move towards a constructivist approach built around inquiry, a student-centered strategy in which learning takes place through discovery (Wilkinson, 2000). STS has since developed into the STEM (science, technology, engineering, and mathematics) movement with the corresponding goal of increasing science proficiency in the United States, with the additional integration of mathematics and engineering (Kuenzi, Matthews, & Mangan, 2006).

### **Rationale for the Study**

The direction of formal education towards assessment and accountability has clashed with what may be perceived as important in science education: innovation, creativity, discovery, and time to make and revise errors. Increased interactions between a teacher and each student would provide an advantage, but in a class with a minimum of twenty-five students interactions are frequently limited. For instance, a traditional classroom discussion may only involve half of the class actively participating. This may limit how well the teacher can gauge student understanding and allowing some students the time to be off task. Students who aren't vocal may struggle to get the attention they require. Incorporating journals in the online learning environment may be an effective tool in such large classrooms to ensure students receive adequate support from their teacher. This format will create a record of

communication that can be accessed both in and outside of the classroom. Online learning can occur two ways: asynchronously or synchronously. Asynchronous communication occurs when the interaction between students and instructors does not occur at the same time and place (Phipps & Merisotis, 1999). The course in this study was taught using Blackboard, a learning management system (LMS). A LMS can be defined as a web-based system that integrates pedagogical and course related tools creating a virtual learning environment where students and instructors can share materials, assignments, and communicate in various ways online (Coates, James, & Baldwin, 2005; Lonn & Teasley, 2009). The “anytime and anyplace” asynchronous communication over the LMS through journals allowed the learner time to reflect and digest research and topics presented in class, while providing more time for interaction between the learner and the teacher.

Discussion tools are online tools that provide places for individuals to collaborate, share ideas and materials, and participate in discussion (Songer, 2013). Journals are the discussion tools of focus in this study. For the purpose of this study, journals were defined as a place on the LMS where students and the teacher exchanged ideas, debated, questioned, and had other forms of conversation. Journals were private areas for a students’ self-reflection with feedback from the instructor only and are modeled after reaction journals, a writing-to-learn pedagogical strategy commonly used in science classrooms (Yore, 2000). This provides opportunities for students to demonstrate their understanding of the material while providing feedback from the instructor.

Journals on the LMS created a record of each student’s progress for the teacher. This provided additional opportunities and time to observe each student’s thought progressions,

and more insight into a student's knowledge base, misconceptions, and other needs academically. Another expectation was this type of communication technology aids in the development of science literacy by allowing students an opportunity to explore, practice, and alter their views through interactions using their own voice in writing. The National Research Council (NRC) defines science literacy as the knowledge and understanding of concepts and process in science required for participation and decision making in economic policy, and public and cultural affairs relating to the discipline (National Research Council (U.S.) & NetLibrary, 1996). Norris and Phillips (2003) refer to reading and writing in science as the *fundamental* sense of scientific literacy, and the *derived* sense as being knowledgeable and educated in science. For this dissertation, when referring to science literacy the definition stated by the NRC was used. When reference is made to content area literacy it refers to the ability to read and write for the acquisition of new content knowledge in science (McKenna & Robinson, 1990).

Learning dimensions associated with journals are the evaluation and communication of scientific ideas and the formulation of scientific knowledge from evidence (Songer, 2013). Online journals are areas to share the knowledge collected and receive feedback with scaffolding. This environment, which was facilitated by teacher mediation, fostered discourse, diverse opinions, personal knowledge, and critical thinking, while adding a technological component to classroom instruction.

## **Need for the Study**

The role of online journals in the secondary classroom is relatively untouched in academic journals despite connections with educational initiatives. It may be an effective method for integrating technology, increasing opportunities for reading and writing, and differentiating instruction by creating more opportunities for interactions between each student and the teacher.

## **Purpose of the Study**

This exploratory emergent design study was intended to provide preliminary data addressing the initial research question: “What interactions are going on between teacher and student in the journal dialogue?”, and may also have implications for literacy in other content areas beyond science. Participants in this study included high school students and the researcher, who was the teacher. The students were part of a Cambridge Advanced International Certificate of Education (AICE) Marine Science Course. The primary goal of the course is to cover content enabling students to pass AS and A level examinations and receive college credit. The teacher’s goals were the following:

- i. Learn how students made meaning from information individually, instead of as a class unit.
- ii. Provide students more genuine experiences in science.
- iii. Personalize investigations, creativity, introduction to current research/issues, etc.
- iv. Get to know students on a personal level.

Reflective online journaling between the student and the teacher were used to supplement teacher instruction. An emergent question was “What were the benefits to the students and teacher?”

### **Development of the Investigator’s Perceptual Screen**

Some people spend their entire lives looking for their life’s calling; I never had that problem. In fact, I’ve been interested in marine science since the age of four. It all began when I and my family moved from the middle of Indiana to Florida’s west coast. With the Gulf of Mexico as my playground, I swam, snorkeled and fished my way through my childhood. As a result, my answer to the question, “What do you want to be when you grow up?” resulted in the same answer for over a decade: a marine biologist. From that point on my goal was to be successful in school in order to go to college and pursue a career in marine science.

Of course, my time in college brought with it a number of new opportunities, but most important among them was the chance to immerse myself in higher level science courses. At Eckerd College I was able to flex my scientific, analytical, and communicative muscles through the curriculum and labs, as well as develop my sense of autonomy through research projects of my own design. The classes I took at Eckerd were vigorous, but I welcomed the challenges. I frequently looked back on how well my teachers in high school had prepared me.

Upon graduation, jobs with just a Bachelor’s degree in marine science were low paying Other Persona Services (OPS) with no benefits. My parents were both teachers, so I decided to try teaching for a year before going to graduate school in marine science. My first job out of college was teaching eighth grade science to students in low socioeconomic levels. Most had

reading disabilities, few parents went to college, and many were second language students. Their trouble with learning content was overshadowed by issues at home that caused behavior issues in class. Nonetheless, I began teaching by mimicking how I had been taught. I overlooked that I had been in advanced classes throughout my time in formal education. Lectures with notes, outlining of chapters, and writing definitions from the glossary were the back bone of my methods. My goal was to prepare them for college science.

I soon realized that many of my students lacked the basic scientific skills that would be necessary for advanced labs and inquiry activities. I left middle school for high school because I thought the students would have higher reading levels and more experience with content. Once again I found the students had difficulties in following simple procedures, a fear of wrong hypotheses, and did not build on their prior knowledge. Not using their prior knowledge was disturbing to me. Besides being deficient in important backbones in science, many students had a general dislike for the subject. Even more appalling to me was their indifference to their grades. Unlike myself at their age, they didn't care if they were accepted into college. There was little motivation to do anything but barely pass for many students.

After many failed attempts, I realized that engaging my students should be my main focus in order to achieve my goal of content acquisition. I started to enjoy my job again. Time in the classroom allowed me to continue working in the area of science, while also allowing me to hone my leadership skills and sense of independence. By designing and implementing my own lessons, I discovered how to effectively educate my students in my favorite subject. My enthusiasm was rewarded with students' enthusiasm. Standardized testing became the focus campus wide in the next few years. My teaching felt forced and creativity I had in the past was

nonexistent. I was even nervous about trying other teaching methods for fear the students would suffer and not pass the test. I once again was unhappy with my job and considered another career. Instead I started my PhD.

I had few education courses even during study for my Master's degree. I had taken mostly science courses. As I learned about philosophies of science education, I realized that I was in agreement. My intent for students who left my class was to have an understanding of science literacy that would not only give them the background to enter a science field, but create an ongoing interest with recognition of its presence in their lives. The idea that research and theories are constantly amended, changed, and challenged is an integral part of what makes science so fascinating. Important, too, are the students' abilities to develop tools allowing them to create research projects designed and evaluated with correct measurement techniques.

I attempted to adjust to the barrage of assessments over the next few years. My methods were still at times focused on content I believed to be unworthy of their time unless they pursued a career in the discipline. A prime example is the Krebs's Cycle, a series of chemical reactions in organisms to produce energy that professors and teachers require their students to memorize. I began searching for ways to satisfy the current needs of the students to be successful on the assessments at the same time stimulating a deeper understanding of science.

Assessments were not the only barriers to learning in my class. An average of twenty-five students per class made it difficult to make each student's learning experience unique. Even if I was able to tailor my lesson individually, I felt that I didn't have the time to get to know



every student, their interests, and needs. Discussions and one-on-one conferencing were used, but I still felt I was unsuccessful in reaching all of the students. I found little time to focus on individual students, because of the classroom activities necessary to prepare for the tests.

At this time I had also started to experiment with Blackboard, a Learning Management System (LMS). Lecture notes, assessments, and other parts of my class started to move onto the online platform. My school implemented the Cambridge Advanced International Certificate of Education (AICE) program and I began teaching AICE Marine Science. The AICE program is an international curriculum and examination system through which students can attain college credit similar to Advanced Placement (AP) and International Baccalaureate (IB). Though Cambridge AICE Program's summative assessments are written explanations, in contrast to assessments in Florida's public high schools composed primarily of multiple choice questions (i.e. End-of-Course exams), their curriculum was still fixed. AICE students were required to demonstrate their understanding of college level material through the formulation of answers ranging from a few sentences to paragraphs, which required them to apply their content knowledge to new situations and solve problems using a scientific method. The first part, AS Level, focused on the scientific study of the world ocean and its ecosystems. The A Level concentrates on the impact of human activity on the ocean and the application of material covered in the AS level.

I had previously (and briefly) experimented with discussion boards and using journals as a place for students to reflect on topics from class. Though success varied, I began to see journals as possible places for a more candid conversation between students and the teacher. The individualized conversations would be a more informal way to differentiate instruction

while learning more about their interests and needs. Students writing in online journals would enable me to offer more creative feedback. Instead of just a response, I could include an interesting article or other references.

Little over 10 years ago Gallagher (1993) described secondary education as having a paradigm where teaching was simply the acquisition of information that frequently focused on memorization, and summative assessments testing if students had attained the information. I saw little difference in the current direction of formal education's new assessments and methods of accountability. It clashed with what I perceive as important in science education: innovation, creativity, discovery, and time to make and revise errors.

Journaling was based on constructivist learning. Permitting students to choose a topic based on their own interests provides an authentic learning experience through inquiry (Shapiro, 2000). Equally, constructivism is an important tool in reflection and critique on the part of the teacher (Tobin & Tippins, 1993). This research is constructivist on the part of the teacher as she learned from the experience of online journals and changed her methods based on personal reflection of her understanding of how students construct their science knowledge.

## **Summary**

This emergent design study was intended to provide preliminary data addressing the integration of online private journals in a secondary classroom. The purpose of the study was to determine the impact of the instructional method of online journaling on the ability of the teacher to differentiate instruction, incorporate technology, and provide more opportunities for reading and writing in the science classroom.

## **CHAPTER TWO:**

### **REVIEW OF THE LITERATURE**

Three related initiatives in current secondary school science classrooms are (a) the meaningful integration of technology, (b) integration of reading and writing in content courses, and (c) differentiation of instruction to meet individual student's needs in courses. The introduction of technology in the form of online journals increases opportunities for reading and writing. This in turn provides the teacher with insight into the students' needs and teacher responses are a vehicle for differentiation. This chapter addresses relevant (a) distance learning concepts that facilitate meaningful integration of technology, (b) literacy addressing reading and writing in science, and (c) aspects of differentiated instruction that enable scientific inquiry.

#### **Theoretical Framework**

This literature review gives an overview of the technology and methods that have shaped web-enhanced secondary classrooms, while relating these tools to literacy and key topics in science education. Due to the speed of advancement in technological fields, terms often have several widely accepted definitions. In here, terms imbedded in the content are defined after the introduction of term.

Limited literature was available on the integration of online journaling in high school science courses. Most studies located reported use of computer journals in higher education

courses. Projecting benefits found in higher education, the teacher implemented online journaling in and outside of her classroom during the second semester of her year-long marine science course. This turned it into a “blended” course, defined as a combination of face-to-face instruction and instruction mediated by technology, in this case a computer and LMS (Chew, Turner, & Jones, 2010).

### **Integration of Technology**

#### ***History of online learning***

In the late 1980’s, during the first spike in distance learning in the U.S., the Office for Technology Assessment (OTA) developed one of the most important research publications on distance learning, *Linking for Learning* (1989). This publication gave an overview and a list of successes of technology being implemented in education systems, in addition to suggesting continued investment and research into distance learning. Despite being dismantled in 1995, OTA’s research led to the creation of the Bipartisan Web-based Education Commission as part of reauthorization of the Higher Education Act (1965), a sign of the U.S.’s realization of the importance of the internet’s role in learning (Bimber, 1996; Gunawardena & Mclsaac, 2004). Within the next decade, *K-12 Online Learning: A Follow-up of the Survey of U.S. School District Administrators* (2007) was published declaring that by 2008 the number of students involved in online course had increased 47% in just two years at public schools in districts studied (Picciano & Seaman, 2007). This suggests that as distance education options for students increase, more time in K-12 classrooms may be spent working in the online medium.

According to Schlosser and Simonson (2009), definitions of distance education must include four characteristics: be institutionally based, have no specific time when the teacher and student interact (asynchronous), communicate through a medium other than the classroom (“interactive telecommunication”) and interaction of participants and resources. Gunawardena (2004) uses the criteria from Garrison and Shale to form the definition that includes “...noncontiguous communication, two-way interactive communication, and the use of technology to mediate the necessary two-way communication (p. 4).” The second definition made clear that communication between the teacher and learner was a central part of the online learning experience. Online learning can occur two ways: asynchronously or synchronously. Synchronous communication occurs between the student and teacher at the same time, such as audio or video conferencing. Asynchronous communication occurs when the interaction is not at the same time and place (Phipps & Merisotis, 1999).

As the internet became the main vehicle for distance education, the *National Forum on Education Statistics* (2006) defined virtual education as “instruction during which students and teachers are separated by time and/or location and interact via computers and/or telecommunications technologies”, and virtual schools (public or private) as offering only virtual courses without a physical facility. Of the K-12 school districts reporting, the *National Center for Education Statistics* (NCES) (Queen & Lewis, 2011) listed 95% had students enrolled in distance education courses at the high school level, 19% in middle grades, and 6% in elementary.

Florida Virtual School (FLVS) is currently the largest in the country, undoubtedly due to district requirements by the state to allow students to participate in every district (J. Watson,

Murin, Vashaw, Gemin, & Rapp, 2010). Delivery in virtual schools is predominately asynchronous. This requires students to be increasingly independent and self-motivated compared to face-to-face instruction, the familiar method for most students. In a district, the types of courses are credit recovery (62%), dual enrollment (47%), Advance Placement (29%), career and technical education (27%), and other courses (65%). These diverse offerings are examples of how virtual education may begin to fulfill areas once only available in formal schooling. Distance education in K-12 is catching on, and 74% of school districts reporting to the NCES indicated a plan to expand the number of distance education courses offered within three years (Queen & Lewis, 2011).

### ***Online learning in the formal classroom***

Instructional design in distance learning is determined by whether or not the teacher's views support symbol processing or situated cognition (Sherry, 1996). In symbol processing the learner is given information by the teacher and expected to learn it, much like formal lectures. An example in formal classrooms are "flipped" lessons in which teachers record lectures for students to watch outside of class allowing teachers to capitalize on the time in class for more interactive instruction (Tucker, 2012). Situated cognition, understanding specific to the situation, involves more interaction on the part of the learner. Examples in online learning include wikis or discussion forums that allow for more unique student contributions. This technology may provide an environment of collaboration and communication in addition to an immense amount of free and accessible information. Educators may, therefore, have increased opportunities to use a constructivist model in designing their courses. Computers have been

referred to as “saviors” of the education system not only because they allow students to personalize how they learn, but also because they generate a record of the journey (Alonso, 2005).

Frequently, K-12 districts use a technology platform, called a Learning Management System (LMS), where students can access their courses. The LMS provides instructors with tools for creating and editing content in the course, communication tools, assessment tools, and other course resources. Learning objects, which are web-based tools, on an LMS can be used as a vehicle to increase interaction beyond what may be found in a textbook. Even the simplest items, for example a YouTube video, give the learner an opportunity to interact with a resource that they may otherwise not experience. This includes the addition of “hot spots”, or areas in the video that require action from the learner (e.g. a multiple choice question). Learners manipulate these objects, supporting constructivism and generative theory (Bannan-Ritland, Dabbagh, & Murphy, 2000; Ritzhaupt, 2010).

Blended learning is defined as any time a student learns at least in part at a supervised location away from home, and partially through online delivery with some element of student control over time, place, path, and/or pace (International Association for K-12 Online Learning, 2011). The *North American Council for Online Learning* describes blended learning as a combination of classroom and online delivery that should be viewed as a pedagogical approach with a fundamental change to traditional methods (J. Watson, 2008). Characteristics are similar to face-to-face needs: student centered lessons, active learners, etc. Though both definitions are sufficient in describing blended learning, Watson (2008) draws attention to the fact that pedagogical methods in online learning are different than those in face-to-face learning. This is

in contrast to Desmond Keegan's theory that education online should recreate the face-to-face experience (Sherry, 1996).

It is essential that online instruction takes into account the ways information is delivered and received compared with face-to-face instruction. Florida Virtual School (FLVS) is a model that includes a team of professionals directing each area of need as related to their expertise. Teachers focus on students, designers on instructional goals, and web developers on creating a platform that encourages learning (Barbour & Reeves, 2009). This type of organization is not common in traditional schools, where a teacher frequently works in solitary on lesson plans driven by state standards. Though a prime example of blended learning with good intentions, FLVS still struggles with providing valuable educational experiences to their students in science. Despite FLVS's recruitment success the majority of teacher preparation programs continue to not focus on blended or online learning (J. Watson et al., 2010). This may be a concern considering virtual education's rapid growth across the country and its inclusion into graduation requirements.

### ***Online journaling***

As in the physical classroom, teaching using online tools and the internet should resemble constructivist pedagogy that is student-centered. The role of the teacher should be that of a facilitator or "coach" providing feedback and reinforcement to the learners' online journaling, and contributes a socio-cognitive dimension to learning that helps students construct meaning for concepts (Lapadat, 2002) while providing opportunity for reflective thinking and metacognition. Feldman (2000) proposed using reflective discourse to support



student learning. Students express their own thoughts in their comments about their learning. Teachers facilitating using reflective discourse encourage students to formulate their own assumptions, give responses that aren't evaluative, and engage students in making predictions. Though teachers should facilitate instead of drive the conversation, it is recommended that their presence in the forums let the students know their messages are being read (Dennen, 2005).

Learning dimensions associated with journals are the evaluation and communication of scientific ideas and the formulation of scientific knowledge from evidence (Songer, 2013). (Sherry, 1996) suggested that web-based instruction naturally promotes inquiry experiences for students, because they explore and find information that interests them. Students choose which resources will support or reinforce their current understandings of issues and are likely to come across different viewpoints and explanations for phenomena. Bodzin & Cates (2003) noted advantages of using the web over text-based instruction include conceivably more current information, more access to data, and more opportunities to collaborate with peers and/or experts. Journals provide an area for learners to externalize internal thoughts. This relates to Vygotsky's Zones of Proximal Development involving use of verbally mediated experiences by the teacher to support and enhance learning (Glassman, 2001; Vygotskiĭ, Rieber, & Carton, 1987) . Teachers scaffold to advance students' theoretical knowledge by having students share how they are making sense of information in the online journals.

## Reading and Writing

### *Standards*

The *Common Core Standards* (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) are currently being implemented in Florida and across the country. Science teachers are tasked with implementing *Common Core Standards* (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) to satisfy state initiatives. The following standards are relevant to this study:

- CCSS.ELA-LITERACY.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- CCSS.ELA-LITERACY.W.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- CCSS.ELA-LITERACY.W.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

These standards require teachers in all content areas assume partial responsibility for students' reading and writing skills.

### ***Science literacy***

Science literacy is defined as the knowledge and understanding of concepts and processes in science required for participation and decision making in economic policy, and public and cultural affairs relating to the discipline (National Research Council (U.S.) & NetLibrary, 1996). Norris and Phillips (2003) refer to reading and writing in science as the *fundamental* sense of scientific literacy, and the *derived* sense as being knowledgeable and educated in science.

Norris (2003) suggests that in its current state, writing and reading in science classrooms are not being presented as essential components to learning and practicing science, and instead are presented as separate entities. He suggests using writing to give students the opportunity to use higher order thinking skills. The major classes of the skills referred to were developed by Bloom (1956), and his taxonomy is organized to assist educators in the evaluation and creation of curriculum that gives students opportunities to practice analyzing, summarizing, and processing the information instead of predominately memorizing superficial facts.

With the current climate of standardized tests, it is unknown if teachers will be successful in creating a balance between content and other features that play a significant role in developing students' future conclusions about and understandings of science. The ability of our communities to comprehend human impact, emerging technology, and ecology may prove to have far-reaching impacts on the population. In order to prepare for future involvement in science, it is essential that students are taught the ability to go beyond inert definitions and concepts, particularly as the field continues to develop and change requiring constant attention

and addendum to their existing knowledge (National Research Council (U.S.) & NetLibrary, 1996).

Challenges to students becoming scientifically literate are attributed to their lack of content area knowledge, misunderstanding of the objective nature of communication in the scientific community, and insufficient facilitation by the teacher (Yore, 2000). It may also be credited to the advanced vocabulary, as students are charged with the task of not only learning new terminology, but also terminology which may be difficult to visualize (ex. atomic level) (Westby, 2000). Similarly, the structure of the text may be a barrier to learning, as scientific writing is denser lexically, technical, and includes nominalizations creating challenges for students who are struggling readers (Fang, 2005; Unsworth, 1999). Recent analysis of science textbooks showed a decrease in quality representing the nature of science, as well as facts with little evidence in contrast to the true scientific writing (AbdElkhalick, 2008; Yarden, 2009). These issues may also impact assessments in which students are required to clearly state answers using scientific terms. The use of other resources (e.g., articles, books, journals) to support integration of other literature in the classroom increases opportunities for the students to practice reading and writing in science.

When Fang (2005) looked at declining scores in science shown in data collected by the *National Assessment of Educational Progress (NAEP)* he suggested highly specialized grammar of scientific text as one concern. There is a strong relationship between the ability to read and write about science and understanding content knowledge, suggesting the importance of scientific literacy. By improving scientific literacy, students may be better equipped to understand, be critical of, and participate in science. Online journaling may provide students

the opportunity to reflect on their own thinking processes and thereby possibly improve them. Journals (a place for students' reflections) create a record of the student's discovery, construction, and knowledge development while easily allowing the addition of outside resources in the online medium. Further, students can choose resources to read in order to support or enforce their understandings of an issue using current topics.

Currently, writing in formal science classrooms focuses on retelling of information already presented by the teacher with little attention paid to the writing content itself. Yore (2000) found reaction papers that included summarization and reflections by the student were a successful strategy in writing-to-learn. The practices of summarization and reflection can be applied to online journals for students to develop key writing skills while being given practice with science vocabulary. Researchers of a dual literacy and science based program in elementary science classrooms composed of students from diverse backgrounds concluded that students taught literacy in conjunction with science instruction scored higher than a literacy only group and control group on all literacy measures (Morrow, 1997). Since the literacy paralleled gains in scientific knowledge, integration in the science classroom would positively affect both content areas. Other research in science classrooms that melded literacy and science content using peer discussion and analytical writing exhibited increases in content retention (Rivard, 2000), which has future implications for knowledge needed on standardized tests as well as future use of the concepts.

Some modernists may argue against using less formal methods to communicate science knowledge since literature and writing styles are used that aren't practiced in the science profession, and instead endorse using scientific literature and writing records of observations

and formal reports (Prain, 1996). Though scientific writing has a place in the science classroom, it doesn't take into account the students' future relationship with the field, a goal of the STEM movement. It is argued that having students involve prior knowledge, context, and language into the lesson doesn't make the lesson inferior, and instead brings its resemblance closer to how scientists make connections and change their current beliefs in real life, increasing its authenticity (Prain, 1996). As recognized by sociocultural theory, discourse in which a learner changes his or her currently held beliefs is vital in the learning process (Loewen, 1995; Mahn, 1999). Views in science are constantly altered with increasing research and new technology, and skills need to be developed in students that promote an inherent flexibility to deal with these fluctuations. The role of most students will not be publishing in journals, but their future science discourse may involve conversation, both oral and written, in their communities. *Science for All Americans* (Rutherford & Ahlgren, 1991) emphasized scientific literacy would provide a vehicle for people to have a more active role in science that positively impacts their community. To encourage the students' activity in science after educational careers, teachers can determine and support student interest through differentiation of instruction in the classroom.

### **Differentiated Instruction**

Standardized testing and state initiatives coupled with large classes limit how well teachers can gauge students' understanding, development of an interest in science, and make each student's learning experience unique. Teachers are tasked with delivering large volumes of content while working to develop a student's positive relationship with the discipline for

future interactions. Therefore a variety of methods must be used to differentiate instruction in order to accomplish these goals.

Tomlinson (2014) defined Differentiated Instruction (DI) as a teacher's response to students' needs by using a supportive environment, quality curriculum, meaningful assessments, and instruction that evolves with the needs of students. Assignments are tied to students' readiness, interests, and learning profile. McTighe & Brown (2005) noted that though they may seem at odds, differentiated instruction is needed to achieve goals set by *No Child Left Behind* (Act, No Child Left Behind, 2002) , a high priority in education today. An environment can be created that encourages discourse, places value on students' interest, and is linked to students' readiness by varying teacher prompts in online journals. Journals create a record of each student's progress providing the teacher opportunity and time to observe thought progressions and identify knowledge base, misconceptions, and other academic needs.

To be scientifically literate, students are not only expected to "do" science, but to use varying types of discourse to communicate and question, which relates directly to literacy. To improve literacy, Vygotsky (1987) recommended using verbally mediated experiences, with scaffolding at students' Zones of Proximal Development to advance student learning (Glassman, 2001; Vygotskiĭ et al., 1987). His approach to understanding development of thinking and literacy in children was by analyzing how meaning is created out of social interaction. By externalizing internal knowledge (sharing opinions and understandings) with teacher mediation, Vygotsky proposed that students should be given the tools to advance their own theoretical knowledge which evolves depending on how it is perceived by others. Online journals are a natural medium where this type of conversation can occur between students and

the facilitator. Journal entries with prompts by the teacher can be used for scaffolding and to encourage autonomous thought by the student (Davis, 2000). Through these discussions, students are given the opportunity to internalize information, correct misconceptions, and gain understanding of novel concepts (Mahn, 1999; Westby, 2000).

Learners develop ideas about science that do not align with those currently accepted by the scientific community. Simply telling someone his or her assumptions are incorrect doesn't change beliefs (Kern, 2008). Facilitated by outdated instruction, some students fail to see science as constantly evolving, and instead are given the idea that it is a static body of knowledge about which they readily accept and hold inaccuracies. Presenting new information about a subject doesn't usually end the misconceptions. In order for students to accept the new ideas presented by the teacher, they first must realize that their current beliefs don't fit with the new information (Kern, 2008). Without discourse in the classroom where students share their beliefs and understandings the students' misconceptions cannot be corrected or understanding assessed. Online journals offer an individualized approach in which every student has the opportunity to read, write and respond on the topic being addressed. This provides the teacher an opportunity to account for the students' current culture and knowledge, while promoting growth and change. Through this increased participation in social activities, individuals internalize information changes leading to new interpretations of knowledge (Mahn, 1999; Westby, 2000).

Unlike in the past, students leave formal education with more opportunities to engage and interact with their communities and participation in online communication may be a dominate medium. Over the past decade communication and involvement in the internet has



increased at astonishing levels, allowing students access to greater resources. For students to navigate this complex world, they need skills to understand and communicate effectively. By incorporating communication over online LMS science educators can engage students as well as to prepare them for active involvement in the future.

Deng (2010) described online communities as places where students are interactive socially while participating in critical discourse. He suggests that the focus on sociability in blended communities that begin face-to-face should involve a continuation of the already existing connections among the students. Online learning communities that take place outside of classrooms have been found to have a positive effect on students' social skills, knowledge, attitudes, and engagement (Papastergiou, Antoniou, & Apostolou, 2011; Tomai et al., 2010). Students often use social networking sites (e.g. Facebook, Twitter) that have increasingly become areas for cyber bullying (Jones, Mitchell, & Finkelhor, 2013). Facilitation by teachers in online communities in the classroom that encourages "netiquette", defined as professionalism during online communication (Mintu-Wimsatt, Kernek, & Lozada, 2010), may positively impact communication outside the classroom over similar media.

Wishart (2010), indicated students participating in discussion boards were more likely to have longer responses that provided more evidence to support their views and challenge other students' opinions than in face-to-face classes. The common elements, including students having more time to reflect before posting (Barbour & Reeves, 2009), shared between discussion boards and online journals suggest students will also provide longer responses to journals than in exchanges taking place in face-to-face classrooms, thus facilitating more differentiation. Even students who are naturally vocal would have a greater opportunity to

organize their ideas before presenting them. By allowing students access to what seems to be a never-ending amount of information, we enable them to explore the discovery of new concepts via their own methods.

Whether learning takes place face-to-face or through online instruction, individualizing education for students is a shared goal by teachers. Watson (2010) makes the connection that as the *Common Core State Standards* are implemented in K-12 education, along with common assessment, greater opportunity is possible for content creators to make something applicable across the nation, possibly increasing blended and online learning. Journaling over LMS may provide opportunities for learners to progress at their own pace. With the increasing development and use of this technology educators have more access to resources and flexibility in how the material is delivered to the students. This includes access to diverse, constantly evolving material. These along with email and other tools offer students more resources and avenues in which to communicate science both in and outside of the formal classroom.

## **Summary**

This literature review supports online journaling as a method integrating technology, increasing reading and writing opportunities, and aiding the teacher at differentiating instruction to meet individual student's needs. Prior research has shown the benefits of journaling to students and teachers as a method for scaffolding and increasing student-teacher interaction. With the addition of an online platform, students have the benefit of being in close proximity to a variety of resources over the internet. By keeping the journals private the

teacher is able to differentiate the students' learning experiences by providing scaffolding for each individual.

## **CHAPTER THREE:**

### **METHODOLOGY**

#### **Purpose of the Study**

Though research using traditional journals is plentiful in publications, little is known about the role of online journals in secondary classrooms. This study aimed to provide insight to the interactions between teachers and students in a secondary science classroom. This research study took place in an affluent, urban high school marine science course incorporating asynchronous online journaling into a secondary formal science classroom of AICE (Advanced International Certificate of Education) Marine Science AS/A level. The initial research question that guided this study was “What interactions occurred between the teacher and students in the online journal dialogue?” An emergent question was “What benefits did online journaling provide to the teacher and students?”

#### **Research Design**

An exploratory qualitative case study was the methodological framework for this study, which examined the nature of the interactions between a teacher and her students in online journals. Data included journal postings from all students and the teacher throughout the semester, as well as the teacher’s personal journal. Her journals documented (a) her initial description of each student based on knowledge derived from interacting with the same

students face-to-face in the previous semester's class; (b) her decision making throughout the semester; (c) her ponderings about students' learning; (d) her reactions to her interaction with students via Blackboard, and (e) lessons learned from her journaling experience.

### **Respondents**

Respondents were twenty-four junior or senior students in an affluent urban high school. They were enrolled in a course titled, *Advanced International Certificate of Education (AICE) Marine Science AS/A levels*. Students had no previous experience with online journals.

### **Curriculum**

The following were the aims of the syllabus for AS and A level Marine Science (*Syllabus: Cambridge international AS and A level marine science 2011*):

- To enable candidates to acquire sufficient understanding and knowledge to:
  - become confident citizens in a technological world, able to take or develop an informed interest in matters of scientific importance,
  - recognize the usefulness, and limitations, of scientific method and to appreciate its applicability in other disciplines and in everyday life,
  - be suitably prepared for studies beyond Cambridge International A Level in subjects relating to the marine environment, in further or higher education, and for professional courses.
  - To stimulate candidates, to create and sustain their interest in Marine Science, and to enhance their understanding of its relevance to society.

- To develop abilities and skills that:
  - are relevant to the study and practice of Marine Science,
  - are useful in everyday life,
  - encourage effective communication.
- To assist the development of:
  - objectivity,
  - integrity,
  - initiative,
  - the skills of scientific inquiry.
- To stimulate interest in, and care for, the local and global environment, and to understand the need for conservation.
- To promote an awareness:
  - that scientific theories and methods have developed, and continue to do so, as a result of co-operative activities of groups and individuals,
  - that the study and practice of science is subject to social, economic, technological, ethical and cultural influences and limitations,
  - that science transcends national boundaries and that the language of science, correctly and rigorously applied, is universal,
  - of the importance of the use of IT for communication, as an aid to experiments and as a tool for the interpretation of experimental and theoretical results.

The aims of the syllabus reference the importance of the curriculum to more far reaching goals in Science Education. The syllabus development in the UK supports integration

of the tenets of STEM the integration of technology, social issues, and inquiry into the classroom, a complement to STS initially which found its start in the United Kingdom (Yager, 1996).

### **Innovation: Design of Online Journals**

Asynchronous, online journals in this study consisted of writing exercises that were asynchronous and completed in and outside of class. Journals were areas on the LMS where student reflections were answered by the teacher and communication was only between those two individuals. There was a permanent record of the conversation. Journal entries were not a summarization or reflection of content learned in class, but instead a place to engage students' interests and create a connection between the teacher and students.

Journals provided a way for students to record their reflections when new science concepts were introduced in a place that could be reviewed throughout the unit by the student and teacher. The teacher's responses to the students encouraged them to expand on their current understanding of the concept, and included learning outcomes from the syllabus where appropriate. This method allowed the teacher to differentiate her instruction while identifying misconceptions throughout the learning process.

Journals took place in and outside the classroom through the use of Blackboard LEARN, a common Learning Management System (LMS) used in K-12 and higher education. Online journaling was used as a method to integrate technology, increase opportunities for reading and writing, and differentiate instruction by creating more opportunities for interactions between each student and the teacher. This interaction was intended to enable the teacher to

understand how students were constructing knowledge and their understanding of each science topic. Online journaling provided a vehicle to increase both learners' opportunities for reading and writing and the teacher's capacity to differentiate instruction.

The journaling process was a constantly evolving and dynamic conversation between student and teacher. Each journal was devoted to one topic (e.g., climate change) initiated by a prompt from the teacher, followed by student/teacher dialogue throughout the course time allocated for the specific topic for that journal. The time span during which interaction occurred varied from a few days to a few weeks.

When introducing each journal to the students, the teacher explained the following: (a) Written conversation would be ongoing and private between herself and the student. (b) She wanted to find out what a student didn't understand, or know, about the topic. (c) She was interested in students' thought processes; therefore, there were no right or wrong answers. Input was differentiated to each student after the initial prompt identifying a topic. At times it consisted of a question requesting a student to clarify an idea, a probe leading to another dimension of the idea, or suggestions for further investigation when a student showed interest in a particular subject. The structure of the initial prompts changed throughout the semester from highly structured to open-ended.

Students were required to post to their journals and reply to the teacher's comments twice per week minimum. Size of the posts varied. Before the start of the semester students had been active on Blackboard for notes, assignments, and other miscellaneous activities. They had no opportunities to use online journals in an academic setting previously. For all journals, students investigated the web for resources of their own choosing instead of using standard



articles from the teacher. The structure of the journals changed over time in response to student posts or lack thereof, with the first journal, the most structured for content, being a question from a past AICE examination: “*Explain why bony fish need to regulate their water and ion content.*” The final journal had the least structured directions.

**Table 1 Online journal characteristics.**

<b>Journal Name</b>	<b>Characteristics</b>
<b>Marine Physiology</b>	<ul style="list-style-type: none"> <li>• Structured.</li> <li>• Questions heavily associated with content involving the physiology of marine organisms (i.e. osmoregulation).</li> <li>• Teacher scaffolding provided.</li> </ul>
<b>Aquaculture</b>	<ul style="list-style-type: none"> <li>• Topic provided.</li> <li>• Entries entirely student reflections.</li> <li>• Posts related to research and design by the student of a hypothetical aquaculture facility.</li> </ul>
<b>Human Impact</b>	<ul style="list-style-type: none"> <li>• Semi-structured.</li> <li>• Student choice investigation about a climate change topic.</li> </ul>
<b>Ecotourism</b>	<ul style="list-style-type: none"> <li>• Teacher scaffolding provided.</li> <li>• Semi-structured.</li> <li>• Students used classroom content and internet resources to design an ecotourism business.</li> </ul>
<b>Final Project</b>	<ul style="list-style-type: none"> <li>• Teacher scaffolding provided.</li> <li>• Open ended.</li> <li>• Student choice of any marine science topic. Product besides journal entries optional.</li> <li>• Teacher scaffolding provided.</li> </ul>

Students were reminded daily their grade was based on work done each day shown in the journal, not the end product. Students used their journals for reflection, were self-critical, creative, and honest. In addition to journal entries students wrote research papers, grants, contacted experts, and did hands-on science investigations.

## **Data Collection**

This study is a retrospective examination of the intervention (use of online journals) introduced in the second semester of a year-long course. The course met for ninety minutes of two blocked classes each day. The first semester of the year focused on AS level curriculum, the second A level. At the end of the year students took four summative examinations through the University of Cambridge. The first two examinations cover AS material, the second A level which builds on the previous content. Students have the opportunity to acquire two college credits with passing scores. This study examined data relating to teacher-student interaction in online journals with topics tied to A level curriculum.

## **Qualitative Data Analysis**

After the close of the semester data was were collected, imported into Microsoft Word documents, and unique identifiers were removed. The data were coded using conventional content analysis and analyzed for reoccurring patterns of meaning. The construction of categories were derived while data were coded (Hsieh & Shannon, 2005; Merriam, 1998) using NVIVO, software for analyzing qualitative data. Data were imported from the Microsoft Word documents. Nodes, a term used to describe the collection of references, were created to represent the categories. The initial research question was, "What interactions occurred between the teacher and students in the online journal dialogue?" One of the emergent questions was "What were benefits to the students and teacher?"

## **Summary**

This research study took place in an urban, K-12 school. Asynchronous online journaling in a high school marine science course was used as a method to integrate technology, increase opportunities for reading and writing, and differentiate instruction by creating more opportunities for interactions between each student and the teacher. This interaction was intended to enable the teacher to understand how students were constructing knowledge and their understanding of each science topic.

## **CHAPTER FOUR:**

### **ANALYSIS AND FINDINGS**

This chapter provides the results of this study and is organized by iterations in the analysis of this emergent design research. Each successive journal is discussed in the order in which it occurred.

This emergent, qualitative case study was designed to provide insight into the value of online journals in a high school science classroom. It was emergent in two ways:

1. The design of the intervention itself. Meaning, the structure of the questions emerged in response to what was written by students, and the degree to which students progressed towards the teacher's goals.
2. Categories and conjectures emerged from the data in the journals during the research.

Fundamentals of this study were based in constructivism on the part of the teacher as she learned from the experience of online journals and changed her approach.

The initial journal focused on content and teacher driven questions linked directly to AICE content. The journals that followed became increasingly more open-ended, with the final iteration being completely open ended and driven by the student. Each of five journals was initiated by a Brain Dump. A Brain Dump was defined as a post that required students reflect on their prior knowledge related to the topic being addressed. Teacher input after the initial prompt varied, except in the Aquaculture Journal (explanation given later). Student/teacher

dialogue time throughout the course varied from a few days to a few weeks per topic. Students posted a minimum of twice per week.

### **Categorization of Qualitative Data**

The following categories initially emerged from the data. The researcher first analyzed the data by placing student responses into categories that emerged from the initial review of the data in students' journals. Initial categories are as follows:

- Internet Source Shared
- Inferences (Warranted)
- Student Question
- Self-Review and Reflection
- Misconception
- Application
- Personal Interest
- Absolute Statement
- Background Knowledge
- Creative
- Humor
- Vulnerability
- Opinion
- Inferences (Unwarranted)
- Language of Science
- Inquiry
- Incorrect Vocabulary
- Rhetorical Questions

Some of the categories were combined. See Table 2. Categories that were deleted due to low coding and insignificance to research questions were: analysis, confusing statement, language of science.

**Table 2 Categories from the initial coding of the data were combined into like categories by merging.**

<b>Category</b>	<b>Initial Categories</b>
<b>Interpretations</b>	Inferences (Warranted) Inferences (Unwarranted)
<b>Student Question</b>	Rhetorical question Student question
<b>Misconceptions</b>	Misconceptions Incorrect Vocabulary Use
<b>Higher Cognitive Domains</b>	Inquiry Application
<b>Affective Domain</b>	Casual Comment Humor Vulnerability Opinion

After the initial categories were merged, the researcher noticed similarities to Webb’s Depth of Knowledge (DOK) and decided to combine the categories into the DOK levels. The DOK was created for use in developing alignments between curriculum standards and assessments. The description of each of the four levels and the affective domain is depicted in Table 3 (K. Hess, 2006; K. K. Hess, Jones, Carlock, & Walkup, 2009; Webb, 2002). The categories included in the affective domain involve the attitudes, feelings, and other emotions (Klopfer, 1976; Krathwohl & Masia, 1984).

**Table 3** Final category description of the Depth of Knowledge levels and the affective domain. Categories merged to form final iteration are listed.

<b>Category</b>	<b>Description of Category</b>	<b>Categories Merged</b>
<b>DOK 1</b>	<ul style="list-style-type: none"> <li>• <b>Recall.</b></li> <li>• Recitation of facts. Only basic understanding required.</li> </ul>	Background Knowledge Review and Reflect Absolute Statement
<b>DOK 2</b>	<ul style="list-style-type: none"> <li>• <b>Skills and concepts.</b></li> <li>• Requires more decision making and comprehension.</li> </ul>	Inferences Warranted Inferences Unwarranted
<b>DOK 3</b>	<ul style="list-style-type: none"> <li>• <b>Strategic thinking and reasoning.</b></li> <li>• Requires a deeper understanding of the material and application.</li> </ul>	Inquiry Student Questioning
<b>DOK 4</b>	<ul style="list-style-type: none"> <li>• <b>Extended thinking.</b></li> <li>• Frequently involves an extended activity with analysis and synthesis.</li> <li>• Developing implications.</li> </ul>	Application Creative Unique
<b>Affective Domain</b>	<ul style="list-style-type: none"> <li>• <b>Emotions and attitudes towards science.</b></li> </ul>	Casual Comment Humor Vulnerability Opinion Personal Interest

After the combination of categories, the researcher reviewed the dialogue at each node and made revisions. For example, some nodes from the “application” category were removed and recoded for DOK levels 1-2.

### **Journal Findings**

The structure of the journals changed over time in response to students’ posts or lack thereof. Each journal began with a brain dump of ideas and interests. Students were reminded daily their grade was based on work done each day shown in the journal, not the end product.

Table 4 depicts examples of student posts for each DOK cognitive domain.

Table 4 Representative journal posts of Web's Depth of Knowledge.

Category	Student Quotes
<b>DOK 1</b>	<p><i>"Fishes gills have an exceptionally high surface area so that they can collect the maximum amount of oxygen form each batch of water pushed over their gills."</i></p> <p><i>"I think the last time i learned about global wamring was in 6th grade Science class so i dont remember much about it. I know humans have a huge impact on it and some people believe humans are the sole cause of global warming, adversly, some people dont even believe in global warming."</i></p> <p><i>"As I learned this year, having algae and other plants go through excessive growth, it has negative impacts. When they grow too quickly it means death and when organisms die, bacteria make their way into the food chain. The bacteria decompose and use up the dissolved oxygen in the water which kills even more fish. "</i></p>
<b>DOK 2</b>	<p><i>"i didn realize how much it could actually effect earth and every living thing. i also didnt know that temperature change was determined by the greenhouse gas carbon dioxide."</i></p> <p><i>"I understand that there is a lack of energy in the bathyal zone and below but there wasn't just one organism scavenging from the zone, there were several isopods captured along with the Goblin shark. Generally there will be one sole organism from the deep sea feasting so I am confused as to why there were so many Isopods as was the lead scientists on the article."</i></p> <p><i>"I'm still a little confused about why they choose aragonite instead of calcite. If calcite is a stronger form of calcium carbonate, then why don't they begin making the shell out of calcite at their larval form? "</i></p>
<b>DOK 3</b>	<p><i>"Tomorrow I'll look into a direct correlation between the temperature changes and the energy availability. "</i></p> <p><i>"...since tuna constantly drink water to compensate from water loss, they excrete a lot of urine so we will need to check the nitrogen levels at all times."</i></p>



Table 4 (Continued)

**DOK 3**

*“An interesting thing I found on the website is the fact that the marine snail is in danger too. The reason this is important is because the marine snail is an important key in the food chain. They are dissolving the most in the southern ocean, surrounding Antarctica. I then began researching why marine snails are an important key in the food chain. Researchers in Seattle began to take samples of snails and examining them. The outer parts of almost all of their shells were pitted and weak. Pteropods are the main food source for salmon, herring and other fish and if they are becoming less and less abundant, the other fish suffer as well.”*

**DOK 4**

*“I am looking into the intern thing at the moment and the Sarasota Bay estuary program determines if i can pursue my interest in the artificial reef.”*

*“To my successor, the endeavor you are about to attempt is very challenging and will need your full attention and anything less will simply not do...”*

*“The experiment was a sucess to some degree and it definatly supported my hypothesis that the mangroves would remove nitrates, but it did not fully support the idea of stability due to the experiment being for such a short period of time.”*

*“When somebody gets to see something with their own eyes, there is no filter; that person is seeing the raw and uncut version of nature, and sometimes that raw view may not be what it should be. When a tourist visits a place and sees trash and pollution around, it often leaves a mark on them that has the potential to turn that person into a newly discovered conservationist.”*

*“The increase in seagrass could be contributed to an increase in nutrients getting into the gulf due to runoff. As the population increase so did the amount of nutrient rich fertilizers used. This would cause an increase in seagrass due to them being able to use the excess nutrients to grow a large amount. The increase in seagrass should help with the restoration of scallop larvae however we have not seen an increase in scallop population.”*

### Journal 1: Marine Physiology

The first journal, Marine Physiology, was the most structured of the journals. Posts were primarily driven by content. After an initial “Brain Dump” in which students posted their previous knowledge they were asked a question from a past AICE examination: “*Explain why bony fish need to regulate their water and ion content.*” The reason for choosing a question from an examination instead of a student centered task was to use the journals as a place to refine the students’ understanding of the curriculum so they would be successful on the examinations. It was assumed that after the content discussion the communication would turn into something less formal, and the teacher would get to know the student on a more personal level. Students’ answers were short and teacher feedback focused on misconceptions, reminded them to make deeper connections, or give more background knowledge. As seen in Table 5, the initial journal provided more opportunity to identify student misconceptions about the content compared with the other journals.

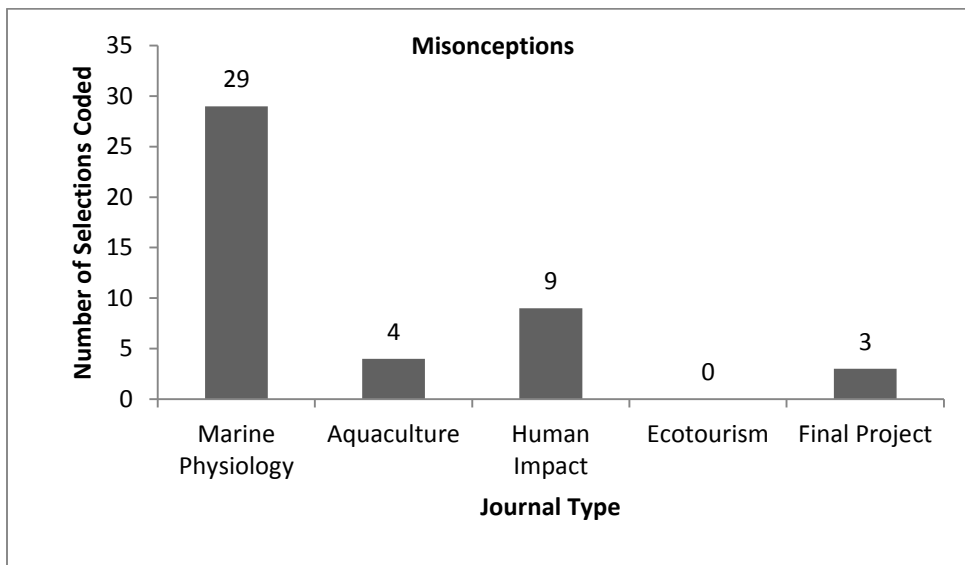


Figure 1 Depiction of the number of misconceptions compared among all five journals.

Students were directed to clarify their answers and expand on statements when it was necessary. For instance, one student thought groupers would have a greater surface area in their gills compared with the tuna since groupers are less active. The student didn't comprehend how much more energy would be needed for a fast moving pelagic tuna even with the water moving over the gills. Students who grasped class content were encouraged to investigate other interesting/meaningful subjects. They were prompted to think about the marine physiology unit and respond with related questions or research. A given example was artificial gills for humans. All students chose a topic other than artificial gills and instead summarized from online resources without applications, analyses, or inquiry. The students who needed review were provided scaffolding by the teacher in the form of elaboration and more resources. Unfortunately, this meant those students didn't receive the same opportunities to research something of their interest.

This journal also provided an opportunity to teach students "the language of science" frequently touched on in class. For instance, one student compared transport systems in fish and coral polyps and labeled the fish "small". The term "small" is relative to frame of reference in science, a frequent misunderstanding when communicating science concepts. Another example is the frequent misuse of the term "extinction" in place of a reference to a decline in population. Students seemed to hesitate posting when unsure of something, despite directions that wrong answers were acceptable. It is possible that despite the welcoming directions meant to encourage openness the students still adhered to typical assignment expectations.

Brain dumps allowed the teacher and students an area to revisit at the end of the unit and to reflect on the students' growth of knowledge. This, along with constant view of

students understanding through the journal communication aided the teacher's understanding of the students' grasp of the material. This provided the teacher with insight into students' needs making learning truly differentiated by editing her prompting depending on the student's need for review. The individualized tutoring accomplished would be unmanageable during normal class times during which the teacher frequently didn't realize how behind a student was before it impacted a summative assessment. Students who were absent had the opportunity to discuss the content missed when absent.

Though the initial journal was a valuable tool for identifying and correcting misconceptions, other expectations were not met. As the teacher stated in her journal, "*The responses were more or less regurgitations of cell transport from biology, molecular level.*" The next post in the journal required students to revisit their previous entry and add onto it using what they had already learned without using outside resources, notes or other reference material. The content was covered thoroughly showing understanding of basic concepts and recollection of details. Posts had no creativity, application of knowledge, or introduction of new concepts. Opportunities for honest and casual conversation were few. This can be seen in Figure 2, which depicts coded entries predominately at DOK 1, recall.

Students' answers were short and teacher feedback focused on misconceptions, reminded them to make deeper connections, or give more background. Responses were focused mostly on DOK Level 1, recall and review. For the next journal, the only teacher input and post was for the main journal topic. By making the journal more of a reflection on the information found on the internet the teacher intended for the students to write in a manner that was more comfortable with no structure from the teacher.

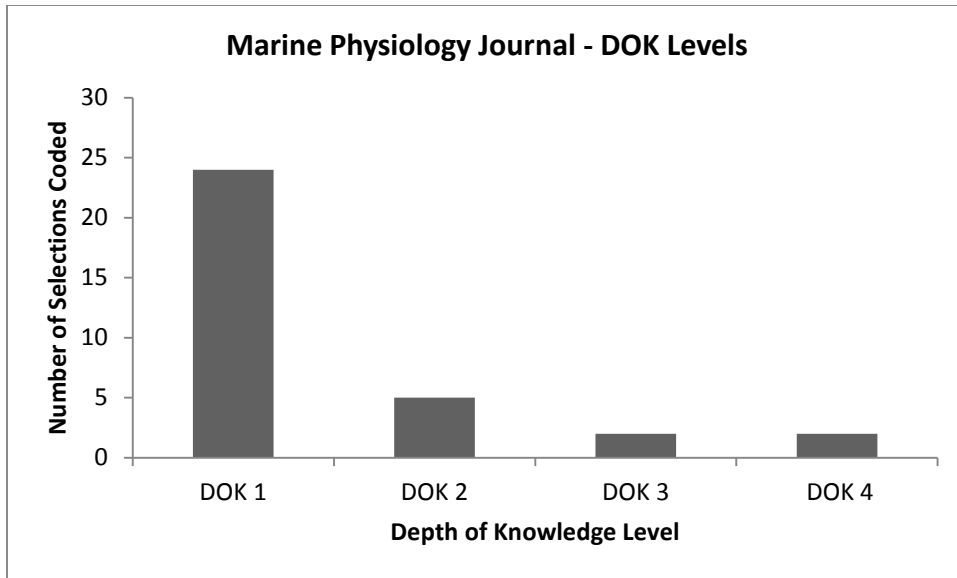


Figure 2 The graph depicts the DOK categories coded in the Marine Physiology Journal.

### Journal 2: Aquaculture

The *Aquaculture Journal* required students to design an aquaculture facility using information in class and online research. Entries consisted of only student posts without probing or direction from the teacher. This was unique only to this journal. Since the previous journal had constant probing and scaffolding from the teacher, it was thought that making the students figure out what they felt was important to write about would change the dynamic and require them to put more effort into their posts. Figure 3 shows the DOK levels for this journal. There were more coded selections in DOK 2 and DOK 4, unlike those in the previous journal. However, the journal itself involving creating an aquaculture facility is DOK 4 since the topic involves creativity and application of concepts from class.

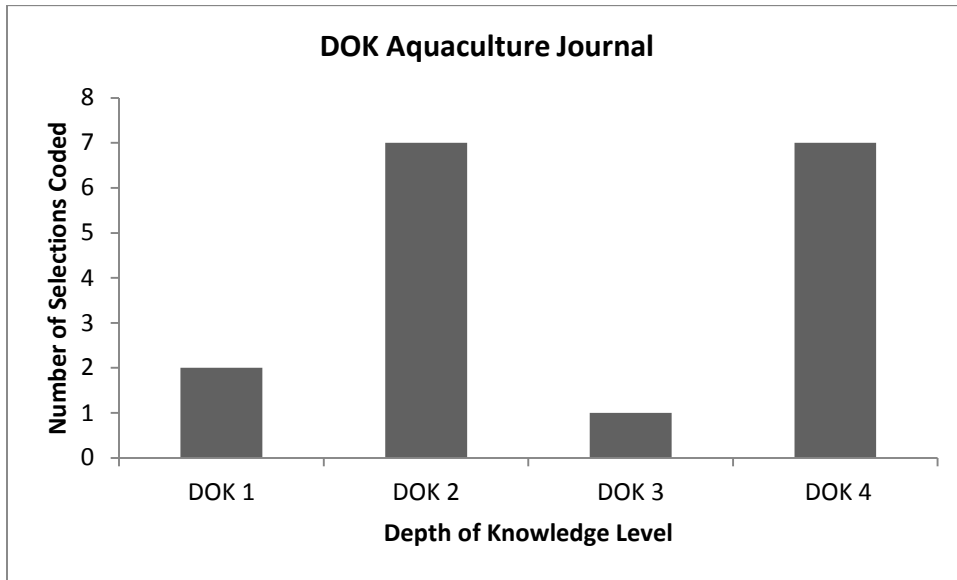


Figure 3 Depth of Knowledge levels coded in the Aquaculture Journal.

The Aquaculture Journal gave students an opportunity to use their own creativity, but once again it did not help the teacher get to know the student. Without scaffolding by the teacher, there were no opportunities for review and clarifying misconceptions until the final product was designed. Despite the number of selections coded at DOK 4 students still didn't show a true interest or inquiry beyond requirements of the assignment.

### Journal 3: Human Impact

The Human Impact Journal focused on climate change. Students were encouraged to question and reminded that there were no “wrong” answers. Instead of reading material provided by the teacher, students searched the web for resources of their own choosing. *“I found a website that explained BECCS...This factory takes in carbon from the air to reduce global warming. This way they are taking the greenhouse gases out of the air. This article caught my*

*eye because I didn't realize this was possibly and in the future could be the solution to global warming."* Most journals focused on evidence for or against climate change, even though they could investigate anything related to the subject. This resulted in most posts being DOK levels 1-3. It did seem to provide more opportunities to reveal misconceptions (see Fig. 1).

One student who wasn't particularly interested in science started out her post with an exceptional understanding of climate change and the greenhouse effect. She included jokes "*So get to the beach ladies it's tanning time!!*", as well as ending with methods to limit human influence on the climate without prompting. The privacy of the journals gave the student a chance to use her imagination with science that she displayed frequently in her drama class. A unique aspect of the course is bi-weekly outings on a boat to collect marine organisms from the bay. Originally it was assumed she took the course to learn how to take care of a saltwater fish tank and go out on the boat, but her other qualities became more apparent. She started responding with very short and bulleted entries after the initial post. Suddenly, she didn't write with her own voice. Since she had previously written about technology or methods to reduce human impact she was asked again to search for more recent methods. The response received once again was bulleted, and oddly enough some of the topics had nothing to do with climate change. They were answer to a previous part of the unit that focused on oil spills, desalination, etc. The teacher, frustrated that the original conversation had now degraded, pasted her response into Google. The teacher found her resource was a *United Nations Framework Convention on Climate Change* (UNFCCC) document called *Technologies for the Adaptation to Climate Change*. The first impression of her not putting in effort was wrong, she chose a reputable source that was a difficult read for a high school student.

One difficulty using online journaling compared with paper and pen is for the teacher to determine whether a student's Brain Dump is the student's prior knowledge or if it is paraphrasing something found through Google.

Though the topic of the journal was limited to climate change, the students were able to take advantage of the researching based on their own interest. One student, a coral enthusiast, came across an article about corals excreting a substance that creates clouds to block out the sun in Australia we were able to share in class. Another self-motivated student posted in response to his brain dump was to think of a way to solve human impact on climate change.

This was the first journal where the students asked the teacher questions about extended topics and concepts they were having trouble understanding. Students seemed to be taking greater advantage of having the teacher as an audience. The conversation many times was light hearted, with jokes and sarcasm even from students who had barely spoken during class.

There were still opportunities to correct misconceptions and tutor students who needed extra help. One student's initials posts were lacking key details. The teacher asked the student to explain the link between the Greenhouse Effect and Climate Change which helped him understand the processes. This was a student who at the time was having personal issues at home and was primarily concerned about his drop in grades. The private online journals allowed the teacher to have more one-on-one time with him as a student. Figure 4 illustrates the interactions involving the students with review and recall at DOK level 1. In contrast to the first journal, Marine Physiology, in addition to creating a place for content, higher order cognitive demands were made of the students. Still lacking were activities in DOK level 4.



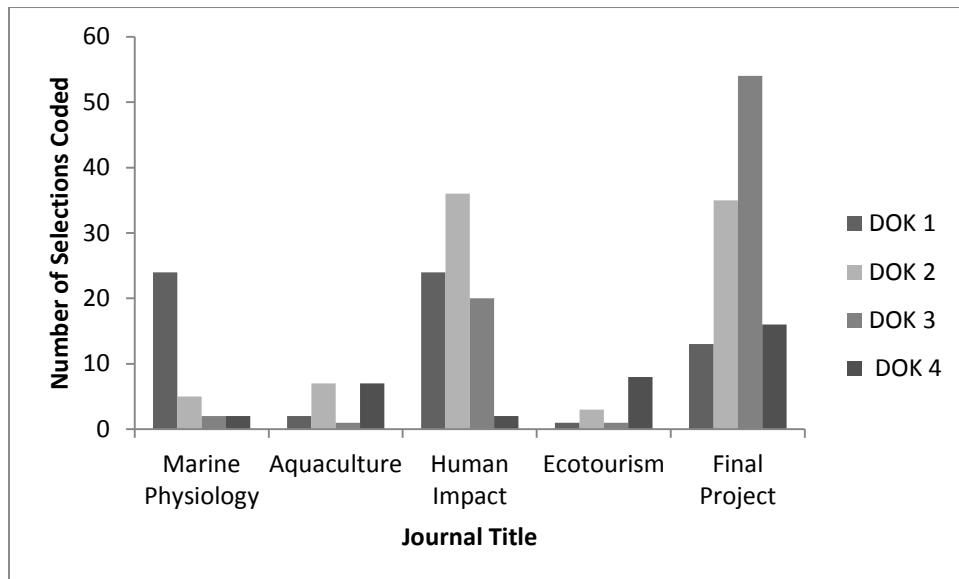


Figure 4 A comparison of DOK levels among journals.

Similar to the previous student, another student had issues with the content and the examinations. Instead of trying to work as a tutor, since her responses were so vague, she was asked to find two pieces of evidence for and two pieces against climate change. She used quotes from NASA and a website called the *Climate Change Dispatch (CCD)*. This provided an opportunity for a discussion about reputable sources and critical research. Her next task was to research the CCD, which she found was run by private citizens without a background in science that did not require peer review for their articles.

Climate change as a topic instigated a dynamic conversation due to the controversy. The topic and posts were tied to course content, but still elicited personal interest from the students. Entries began to be less formal showing emotion and comfort with the teacher. Students used a variety of sources for information (YouTube, scientific journals, etc.). This was the first journal, in which the students asked the questions, but they were infrequent, and at

times garnering students' interest felt forced. Though some entries illustrated the ingenuity of the students, many still focused on evidence for or against climate change, not exploring any deeper or relating it to their own interests.

#### **Journal 4: Ecotourism**

The Ecotourism Journal was similar to the Aquaculture Journal in that students were tasked with designing their own ecotourism business. Concepts from class were creatively applied and students seemed excited. This journal didn't require much ingenuity on the part of the student since the inherent concepts were basic. No misconceptions were seen regarding content. There were many opportunities for creativity. The following student had an idea for laser tag that would be enjoyable to participants and have an impact on scientific research:

The idea behind this is to give people the sensation of hunting without harming wild stocks. Each person will be equipped with a "lasertag gun". This gun will contain a camera and footage recognizing software. The person will "shoot" an animal (A laser pointer will go off showing this action) and the camera will take a picture. If the gun recognizes the animal it will give out points based on how rare it is. (Example : squirrels = 5 points, deer = 20 points, gator = 15 points Florida panther = 1,000 points) This will take place on a national park or a nature preserve. This will not only be fun for people, but allow a new system of recording wild life stocks...

Another student researched actual ecotourism businesses in the state and realized that things are not always as they seem,

A lot of the resorts don't have any actually tours to educate the people on that are taking the tours for fun on the issues and about the wellbeing of the ecosystem that they are touring. Most of the ones that are already established have more of a normal business outlook on gaining profits and when they decided on what activities and amenities that they provide.

This revelation impacted the student and her family when they choose where to spend their money on the next family trip. To have made this journal more worthwhile, it should have had a more realistic goal. At the level of this curriculum students could have been tasked with critiquing an existing ecotourism facility or tour in their community. The students did enjoy the task more than the others, with one student electing to use his ecotourism design in the final project.

### **Journal 5: Final Project**

For the final journal, students were prompted to choose any topic of interest related to marine science for their research. The end result was not the focus, but instead the process of their exploration would be most important. Some ended up writing only in journals while others wrote research papers, made presentations, emailed experts, and created grant proposals.

The most significant difference between the final journal and the others was the quality of conversation. Students did not hesitate to ask questions and for direction for their research. "I have no idea what to focus on this week. Maybe I can research ways I could have made my experiment more accurate and reliable?"

From initial discussions about their final project, the teacher encouraged students to do in-depth investigations. Most students found creative ways to do this in contrast to their initial ideas of making a simplistic project (e.g. PowerPoint presentations). A high percentage of students initially wanted to make PowerPoints, but then encouraged to focus more on the process before deciding on their final product. Overall, students had a difficult time understanding there may not be an “end product” to their effort. This was extremely frustrating for students that felt the final grade was more important than the learning process. Two students were at one point reduced to tears in frustration. The teacher responded by explaining that their grade would be based on effort, and as long as they participated in the journals they would receive a high grade.

Students who previously struggled did in the end provide two very unique and high quality journals. One chose a topic that was already covered in class and at the start of the journal used it as a place to summarize random articles online she found about climate change. When prompted multiple times to search for something of personal interest or delve into a more difficult topic she repeatedly stated she didn’t understand what was required for her to get a high grade. In the end, she found an article on climate change related to aquaculture and mollusk shells.

Today I decided to narrow down my research and do it on an individual shellfish, the oyster. However, in the beginning I thought I would look into how the larval staged oyster is affected by a drop in Ph. The larval oysters are actually the most prone to ocean acidification; like the other shellfish, oysters need a shell to survive. However, what is different about the larval stage of the oyster is that larvae shells are made out of

aragonite. Aragonite is a form of calcium carbonates that is more susceptible to erosion at a low pH.

Then I decided to learn more about aragonite because I was not quite sure what it was or why larvae made their shells out of it. The structure of aragonite is considered to be meta-stable; I actually found out that even without lower pH, the aragonite can still dissolve in normal temperatures. Over time, it mixes with calcite, which is more stable for making shells. I'm still a little confused about why they choose aragonite instead of calcite. If calcite is a stronger form of calcium carbonate, then why don't they begin making the shell out of calcite at their larval form?

In those two paragraphs the amount of inquiry and higher level cognitive thinking was beyond anything she had produced the entire year despite her belligerence regarding the final journal. In the end, she was proud of her journey and the concepts she discovered.

Teacher responses varied, at times just asking what they planned to do next. In addition to providing scaffolding, the teacher sometimes took the role of learner and asked questions of her own interest. One example was regarding sea urchins deaths: "97%? That's a high number. Did you find any information about what caused the disease to spread? Introduction, climate, etc. Are they still investigating it? I hope FL is putting resources towards its cause and cure."

One student investigated the mass death of a tank in the back of the classroom. She found that sea cucumbers released toxin when they die, and one death of an organism most likely caused the other animals to die as well. She offered suggestions for tank care, "It is likely that we have to drain the tank before we put any more animals in there. I will do more research on what we are supposed to do if this happens on Monday." If not for the student's research

the teacher would have assumed it was elevated nitrites and just left the tank empty over the summer. Another student took the opportunity to make his interest in the aquaculture of coral a reality, and aggressively looked for ways to fund his project in and outside of the classroom. As one student wrote, “Could we possibly use some of the scallop grant money for the coral aquaculture project? I could bring in some frags of coral off of colonies from my tank at my house.”

Journaling led to an end product that was representative of each student’s strengths and interest. One student wrote a letter to future students to create and study an artificial reef, “To my successor, the endeavor you are about to attempt is very challenging and will need your full attention and anything less simple will not do. When building an artificial reef there are two options...”. His activities included initiating an internship with a local marine science nonprofit, and speaking with the family member about securing grant money through the community’s educational foundation.

Other students used the journals as a way to reflect and ask questions about experiments they created,

My plan is to go into the nearby mangrove swampy place and collect propagules of the red mangrove (based off of my research they are the best for tank life being the most resilient.) after collecting the propagules we can immediately start growing them in the tank and they will start growing almost instantly. But of course, as you first said we need to have a nitrogen spike within the tank for the mangroves to remove.

It was an area to comment on their mistakes while performing their experiments with some students, “Today I decided that comparing the ion concentration between salt water and fresh

water fish is nearly impossible, because I would need to bleed the fish immediately so the blood doesn't coagulate.” The journals offered the time and an area to discuss issues with scientific procedures and inquiry that there wasn't time for in the beginning of the year. Students learned that doing science isn't as simple as lab experiences in traditional science classes.

The journals themselves became a creative area for some students. When one suggested writing a song there was concern about being able to create something of true educational value. In the end, the song was targeted at elementary school students with the goal of teaching them advanced topics through song:

How do they live you might say?  
they have coral polyps and dinoflagegates  
and though people say they are not coral reefs are really animals too  
As long as the sun can reach them  
and the chemical balanced stays in key (budum tss song pun!!)  
The coral reef wont bleach

With scaffolding from the teacher though online journaling, this student was able to create a product that satisfied her own interests and added to the education of others.

DOK levels coded were compared in the three most diverse journals (See Fig. 5). Ecotourism and Aquaculture journals were removed because their unique properties compared with the others (e.g. student only for aquaculture) and their shorter length of posts. Marine Physiology, the first journal, was the most structured and tied to course content. The Human Impact Journal was still partially structured, but had open ended components for students to do individualized research. The Final Journal was entirely open ended. A comparison among

the three journals demonstrated an open ended journal provided greater opportunity for students to work at the DOK 3 and 4 levels, while still providing opportunities for recall and review.

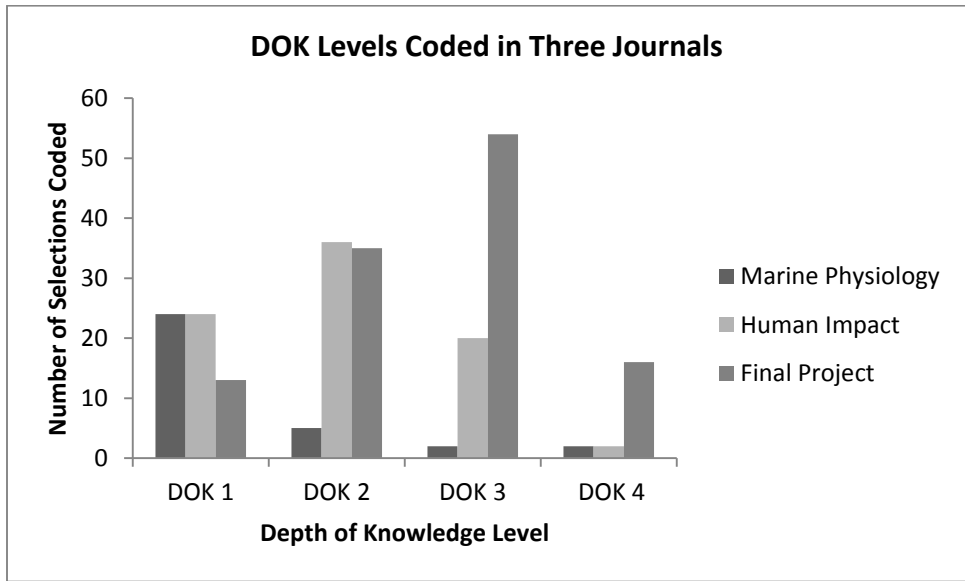


Figure 5 The DOK levels coded for three differently structured journals. Marine Physiology was highly structured, Human Impact was slightly structured, and Final Project was entirely open ended.

It should be stressed that even though the later journals provided more opportunities for students to work in high cognitive domains there was value in a structured journal for checking the students' understanding of the material presented in class. However, for this innovation the goals of the teacher went beyond students' ability to recall (more meaningful connections with students, etc.) and were not met with the more structured journals.

### Affective Domain

Codes under the Affective Domain included the nodes of Casual Comment, Humor, Vulnerability, Opinion, etc. Creating an environment in which the teacher was able to



communicate that she cared about the student, as well as a place where the students felt comfortable, was a primary goal of implementing the private online journals. The data showed (see Fig. 6) these interactions occurred more frequently in the final, open-ended journal than the others.

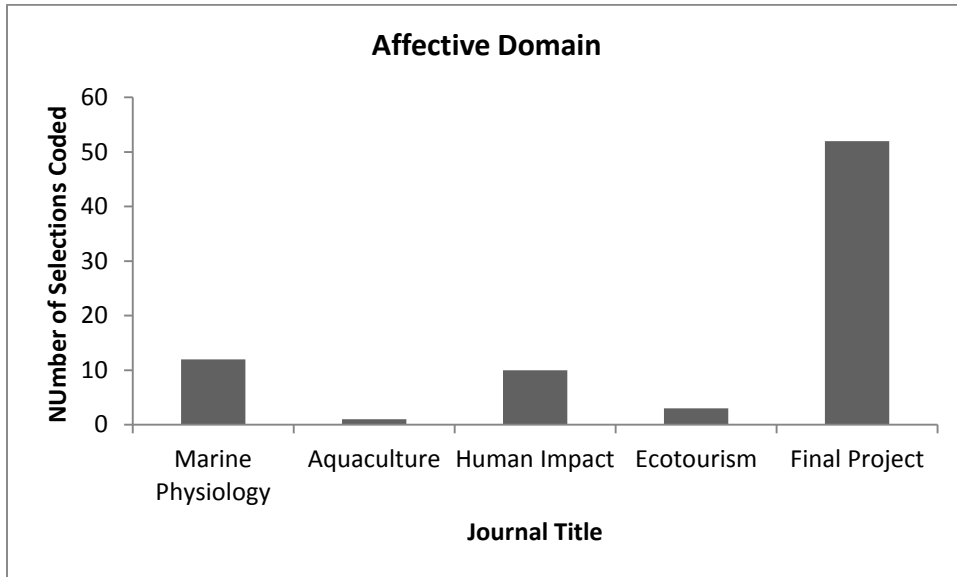


Figure 6 Number of nodes coded for each journal under the Affective Domain.

In addition to the open-ended structure, students' expression in the affective domain may also be attributed to students becoming more comfortable with journaling as the semester progressed. Considering the differences in the scaffolding by the teacher in each journal, the Final Journal is distinctive.

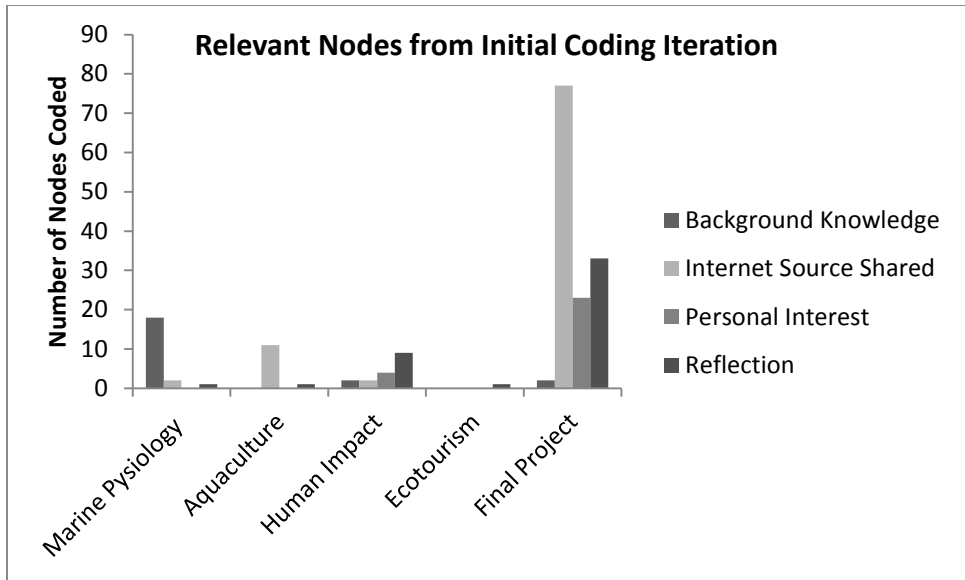


Figure 7 Selections coded for background knowledge, internet sources, personal interest, and reflection in all journals.

Figure 7 shows there were a significantly greater number of internet sources accessed in the Final Journal compared with the previous four.

### Benefits to Students

Online journaling provided students opportunity to make explicit their prior knowledge about the topic and construct new information. Immediate availability of information on the internet provided just-on-time delivery when the need to know arose while writing posts. By retrieving information using a variety of sources such as videos, academic journals, and news reports students were able to develop deep knowledge of their topics (Fig. 7). “After seeing the video explaining different methods of aquaculture, I'm leaning towards creating my aquaculture facility outdoors, implementing natural coastal areas as habitats, to reduce costs.”

Students edited their comments during self-review creating more self-regulating learners.

Students had practice developing skills supporting the Common Core Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

Students were encouraged to pursue their interests, even beyond science, by the open ended and evolving prompts from the teacher. For example, a student used his idea for an ecotourism business in a previous journal to research how to use Kickstarter (an online funding platform) and actually make it a reality. This led him to learn about patents.

I also reaserched into Patons. I had read yeaterday that more the 82 billion dollars in paton violations has been collected. I want to make sure i am not putting anything on the market that has already been pattoned, cause i dont have money to pay a patton owner.

Having students relate the journal entries to their own interests kept them engaged.

The one-on-one tutoring by the teacher during the journaling benefited all students. Misconceptions were identified and corrected, "...in organisms where they have a high surface area: volume ration, such as the tuna, they dont need a specialized gaseous exchange." Teacher response: "The high surface area of the gills is the specialized system for gas exchange." The online journals enabled students who were second language learners, or shy, who normally felt uncomfortable to participate in classroom discourse.

### **Benefits to the Teacher**

The teacher benefited by being able to study individual students as well as the class as a unit. Students shared their background knowledge freely: "I think the last time i learned about

global warming was in 6th grade Science class so i dont remember much about it.” The teacher was able to discern individual student’s interests and emotional connections. She had time to formulate her feedback and revisit student’s previous posts to make her responses more meaningful to the students.

The teacher and students experienced natural spontaneity linking to websites. The ease with which they pasted and accessed URL’s created dynamic conversation. An example is a student post regarding the teacher’s plan to grow juvenile scallops the next year: “Do you know which micoalgae you are going to use? This article says...” which had a significantly higher growth rate than other commonly used strains.” Another example is the teacher sharing a humorous video on climate change with a student, “I’m not sure if you can access this, but it’s funny and related to your research...” Thus the teacher benefited from exposure to new resources and teachable moments discussing importance and meaning of reputable sources.

The way in which online journals were used increased interaction with students, creating a closer relationship and an environment for creative discourse and differentiation. The teacher was able to determine the meaning students were making of material presented in class. She differentiated by constructing feedback and probing questions based on previous student responses. For example, students who had issues comprehending current topics or inadequate background knowledge were given a review of the information. Those who were advanced were probed to investigate topics further, or of their own choice.

## Summary

In this chapter, qualitative data from student and teacher interactions in online reflective journals was coded using conventional content analysis. Overtime, journals evolved from structured to unstructured in their design. The results of this study suggest using online reflective journaling as an instructional method to differentiate instruction, satisfy Common Core initiatives, and create a more engaging and dynamic environment for learning science content. The implementation of journals enabled the teacher to focus on student interests and needs as she was provided a continuous view of instructional impact by focusing on individual students in addition to the class as a unit.

The one-on-one tutoring from the teacher during the journaling benefited all students as misconceptions were identified and corrected. The teacher differentiated by constructing feedback and probing questions based on previous student responses. This scaffolding by the teacher, as well as the choice of resources by the student, encouraged students' interests beyond curriculum and advanced topic discussions. The closer relationship between the students and teacher fostered a safe environment for creative discourse and differentiation.

## CHAPTER FIVE:

### CONCLUSION

#### Summary of the Study

This exploratory emergent design study aimed to provide insight to the interactions between teachers and students in a secondary science classroom. The study took place in an affluent, urban high school marine science course incorporating asynchronous online journaling into a secondary formal science classroom of AICE (Advanced International Certificate of Education) Marine Science AS/A level. The initial research question that guided this study was “What interactions occurred between the teacher and students in the online journal dialogue?” An emergent question was “What benefits did online journaling provide to the teacher and students?”

The teacher’s goals were the following:

- i. Learn how students made meaning from information individually, instead of as a class unit.
- ii. Provide students more genuine experiences in science.
- iii. Personalize investigations, creativity, introduction to current research/issues, etc.
- iv. Get to know students on a personal level.

The structure of the journals changed over time in response to student posts or lack thereof. Data were coded using conventional content analysis and analyzed for reoccurring patterns of meaning. Data included journal postings from all students and the teacher throughout the semester, as well as the teacher's personal journal.

Online journaling provided a vehicle in the classroom to integrate technology, increase opportunities for reading and writing, and differentiate instruction by creating more opportunities for interactions between each student and the teacher. These interactions were assisted the teacher in determining how students were constructing knowledge and their understanding of each science topic.

## **Conclusion**

To the extent a science teacher implements online journaling using the parameters described in this study he/she can create an environment in which the following are apt to occur:

1. The teacher gets to know the students on a more personal level than sometimes possible in large classrooms.
2. The teacher derives insight into students' interests and how students are making meaning of course subject matter.
3. The teacher provides genuine experiences in science learning individualized for student needs.
4. The teacher contributes opportunities for science students to enhance reading and writing skills.

The progression from a structured to an unstructured journal was a key learning experience for the teacher. Only when the journal was completely open ended were all the teacher's goals satisfied. The introduction to journaling was unique. Reassuring students that "wrong" answers and questions were appropriate in their journals contributed to the conversation becoming more honest. Constant scaffolding that supported the students' interests and displayed sincerity from the teacher created a more dynamic conversation than a traditional journal focused on summarization and reflections of content. All aspects were supported by the addition of the online environment where inquiry and research used different online mediums, increasing the opportunities for reading and writing in science classrooms. Online journals have the potential to enhance the human dimensions of science learning in high school classrooms.

### **Dissemination**

Findings were shared at the Association of Science Teacher Education Conference (January, 2015) and will be submitted to several education journals.

### **Limitations and Future Directions**

This exploratory study was intended to provide preliminary data and concentrated on the actions of the teacher. Since the teacher was a participant in the data collection and analysis, triangulation from an outside party would added to the credibility of the study.



In regards to external validity, the population validity was low, as the students were in an advanced course. It is likely that they are of a high socioeconomic status and receive more support from home compared with other students in the district.

Broader impacts for the future may be further research on the role online journals in the secondary classroom, an area relatively untouched currently in academic journals. This may lead to increased use of technology in the formal classroom through learning management systems, and possibly discussion forums. The research may also have implications for literacy in other content areas in addition to science. Results will be shared with other professionals through publications and conferences.

A limitation of this study is its applicability in the formal classroom. Training students to use the new medium, facilitating their journal, and grading requires a significant amount of time outside of class for the teacher. Access to computers may also limit participation. The benefits emerging from this research study suggest it would be beneficial to provide support in the earlier grades or other disciplines for similar opportunities to familiarize the students. It may be necessary for future research to examine the effect of the online journaling on standardized test scores in order for acceptance by administrators and district personnel.

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## APPENDIX A:

### IRB APPROVAL



RESEARCH INTEGRITY AND COMPLIANCE  
Institutional Review Boards, FWA No. 00001669  
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799  
(813) 974-5638 • FAX (813) 974-7091

February 13, 2015

Megan Ehlers  
USF St. Petersburg - College of Education  
2610 4th Ave. N.  
St. Petersburg, FL 33713

**RE: Expedited Approval for Initial Review**

**IRB#: Pro00020648**

**Title: Student-teacher interaction through online reflective journals in a high school science classroom: What have we learned?**

**Study Approval Period: 2/13/2015 to 2/13/2016**

Dear Ms. Ehlers:

On 2/13/2015, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

**Approved Item(s):**

**Protocol Document(s):**

[Protocol Guidelines.docx](#)

This study involving data pertaining to children falls under 45 CFR 46.404 – Research not involving greater than minimal risk

**Consent/Assent Document(s)\*:**

Waiver of process granted

\*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review

research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis).

Your study qualifies for a waiver of the requirements for the informed consent process as outlined in the federal regulations at 45CFR46.116 (d) which states that an IRB may approve a consent procedure which does not include, or which alters, some or all of the elements of informed consent, or waive the requirements to obtain informed consent provided the IRB finds and documents that (1) the research involves no more than minimal risk to the subjects; (2) the waiver or alteration will not adversely affect the rights and welfare of the subjects; (3) the research could not practicably be carried out without the waiver or alteration; and (4) whenever appropriate, the subjects will be provided with additional pertinent information after participation.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

A handwritten signature in cursive script that reads "John A. Schinka, Ph.D.".

John Schinka, Ph.D., Chairperson  
USF Institutional Review Board