A MODEL FOR SEMI-INFORMAL ONLINE

LEARNING COMMUNITIES: A CASE STUDY OF THE

NASA INSPIRE PROJECT

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CHAPTER I

INTRODUCTION

Technology has changed the way we access information, the way we interact with

other individuals and even the way in which we do everyday tasks evidenced by the fact that

70% of our nation's 4-6 year olds have used a computer and, on any given day, 68% of

children under two will use a screen media for an average of just over two hours (Jordan

School District, 2007). Technology is no longer available only to the rich and privileged; it

has infused itself into everyday life transforming lives at home, at work and even at school.

Today's teens were "born into a digital world where they expect to be able to create,

consume, remix, and share material with each other" (JSDT, 2007). And, given the

increasing prevalence of online networking opportunities and the fact that networked

architectures are transforming college recruiting, hiring practices, and civic participation in

the USA (as cited in Greenhow & Robelia, 2009), it becomes important to consider the

changes that access to these technologies can bring to the life of the average American

student.

"The contexts for teaching and learning today have become increasingly complex as

students learn across a range of physical and cyber spaces" (Greenhow & Robelia, 2009,

"Introduction", para. 1). It has become necessary for educators to acknowledge the changes

that technology brings, not only to a student's future career but also to everyday educational experiences. New, emerging technologies and an increase in access to these technologies, both in and out of school settings, allows students and educators to learn in contexts never previously considered. Recent years have shown a dramatic increase in research into non-traditional sources of education exploring a variety settings including online learning and informal education. "Several factors are driving recent efforts to examine students' learning experiences outside of school, including concerns about retention, academic achievement, school completion, and workplace preparedness, as well as reports of students' dissatisfaction and disconnection from school" (Greenhow & Robelia, 2009, "Introduction", para. 1). It is advantageous to "pay attention to our children's intensely rich information experiences" (T4-Jordan School District) by providing different ways in which they can learn while it becomes increasingly important for educators to "help students enact legal, ethical, responsible, safe, and advantageous online" communities (Greenhow & Robelia, 2009, "Discussion", para. 2).

Greenhow and Robelia (2009) state that "we need research efforts that illuminate how the Web-based communication and network visualization tools found in today's social software can shape content area learning and social practices, and how these, in turn suggest new learning and teaching theories" (Discussion section, para. 3). An increasing amount of research is being conducted in the area of online learning and the advantages that this learning setting can bring to the face of education. Gray (2004) states that "it is important that we increase our understanding of the functions online communities can serve in an organization and what factors influence learning and participation in these voluntary contexts" (p. 21).

This quote hints at the increasing interest into another area of non-traditional education, an area that is typically referred to as informal learning. According to Walters (2009), informal learning is typically "unregulated and unsponsored" (p. 52) while Boud and Middleton (2003) contend that it is simply the learning that "occurs unprompted by deliberate facilitation" (p. 194). Unlike formal education, which traditionally occurs in schools, universities or some other formal training situation, informal learning can take place in a much wider variety of settings giving greater flexibility and freedom to learners (Eraut, 2004; Lima et al., 2010). By recognizing the social significance of learning from others (Eraut, 2004), the continuous process by which "attitudes, values, knowledge and skills are acquired from daily experiences and educative influences" (Walters, 2009, p.51), and the importance of learning as, not a special activity, but an aspect of everyday life (Gray, 2004; Lave 1991), informal learning allows individuals to learn as they go about their daily activities in work, at home, or in other spheres of life (Center for Workforce Development, 1998; Brisson et al., 2010). An increasing interest in lifelong learning has prompted this interest in informal learning contexts and has allowed students and educators alike the ability to consider that learning does not necessarily need to occur only in the traditional classroom. In fact, informal learning opportunities allow individuals to increase their interest and understanding of an area of pursuit (Bevan et al., 2010a). An increase in access to technologies has made the possibility of informal learning a reality to virtually everyone.

With increasing access/interest into information and communication technologies (ICTs), which includes a variety of technology including the Internet and elearning materials, emerges a new wave of opportunities for both students and employees as they turn to these technologies as learning tools both inside and outside of their formal educational settings

(Greenhow & Robelia, 2009; Helou, Li, & Gillet, 2010; Sambrook, 2006; Walters, 2009).

The number of interactive Internet based tools, also referred to as Web 2.0 tools, increases daily and as these tools are designed for the average person to create communication tools, databases, interactive features on their websites, more and more individuals are taking it upon themselves to create their own informal online learning communities with individuals who have similar interests and educational experiences. For some, an online community is the "only viable learning option" (Thompson, 2011, p. 193). However, these communities can be ineffective, illustrating the "messiness" of the term online communities and the "sometimes contradictory use of these spaces" (Thompson, 2011, p. 193).

The Interdisciplinary National Science Project Incorporating Research and Education Experience (INSPIRE) is a "multitier year-round program designed for students in ninth to 12th grade who are interested in science, technology, engineering, and mathematics (STEM) education and careers" (NASA, 2010). This project, one of the National Aeronautics and Space Administration (NASA)'s national K-12 education programs, gives high school students the opportunity to engage and interact with like-minded peers and to prepare themselves for a future career at NASA or in STEM related fields. The "centerpiece" of INSPIRE is the Online Learning Community (OLC) which,

> provides a place for INSPIRE students to interact with their peers, NASA experts and education specialists. Through grade-level-appropriate educational activities, chats and discussion boards, students and their families are exposed to the many careers and opportunities NASA has to offer. In addition, the OLC provides the parents/guardians of participating students with resources designed to help them champion their child's education and career goals. (NASA, 2010)

The INSPIRE project has, for the past three years, successfully hosted and maintained an online learning community in which informal learning is present. Students within the INSPIRE project have many resources made available to them as members of the community including activities designed to promote interest and knowledge in different areas of STEM education, NASA competition opportunities, chats with NASA experts, career information and resources, peer discussion boards, and much more. These resources are accessed on an as-needed or as-desired basis giving the students the opportunity to learn and engage with others as they see fit. With the success that the INSPIRE OLC has experienced as evidenced by evaluation reports and continued participation of OLC members, much can be learned from this project about the creation of, and maintenance of, an informal online learning community.

Problem Statement

Of increasing interest is the area of online education but as Thorpe (1999) points out, most work on the development and evaluation of online education has been conducted in the higher education setting. Research in online education at the K-12 level is increasing as groups such as the International Association for K-12 Online Learning (iNACOL) work to better facilitate collaboration and research in formal K-12 online education. However, there remains very little research in informal online learning at the K-12 level. The NASA INSPIRE Project has experienced challenges and successes in creating an informal online learning community (OLC) where participants, aged 14-18, can engage in STEM related activities and experiences. These factors can provide valuable insight into the area of online education as a whole, and into informal online learning communities specifically.

Many educational models have been created for both the area of online education and informal education. Most of these models, however, are based purely on theory and have little experience in the "real-world" of education. More specifically, there is a lack in the research for models or frameworks assisting in the development and evaluation of informal online learning communities specifically. A model based upon theory, research and practice would be beneficial to others attempting to develop and maintain an informal online learning community.

Purpose of the Study and Research Questions

The purpose of this study was to develop a model of informal online learning communities based on theory, research and practice. The following research questions were examined:

1. How does INSPIRE model informal online learning?

2. How does the INSPIRE informal online learning model compare to current models of informal learning and online learning?

3. How can INSPIRE's educational model be adapted to align with current research and where can current research benefit from INSPIRE's success as evidenced by evaluation reports and continued participation of OLC members?

Theoretical Framework

In order to appropriately choose the methods and methodologies used in a research study and to justify this choice, it is important to understand the purposes of our research (Crotty, 1998). Going beyond that, "justification of our choice and particular use of methodology and methods is something that reaches into the assumptions about reality that we bring to our work" (p. 2), our theoretical perspective. The theoretical perspective is the

"philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria" (p. 3). Theoretical perspectives are grounded in an epistemological stance, or, how we know what we know.

Theoretical Perspective.

The theoretical perspective is the philosophical stance that lies behind the methodology. The theoretical perspective "provides a context for the process involved and a basis for its logic and its criteria . . . Different ways of viewing the world shape different ways of researching the world" (Crotty, 1998, p.66). The interpretivist theoretical perspective "looks for culturally derived and historically situated interpretations of the social life-world" (Crotty, 1998, p.67). Symbolic interactionism, a sub-division of interpretivism as a theoretical perspective, "explores the understandings abroad in culture as the meaningful matrix that guides our lives" (Crotty, 1998, p.71). This perspective seeks the meaning of experience as an exploration of culture and consists of three basic interactionist assumptions: human beings act based upon the meanings that things have for them, the meanings ascribed to these things come from the social interaction that one has with other individuals, and these meanings are handled through an interpretive process on the part of the individual with whom the interaction stems from (Crotty, 1999, p.72,74).

This theoretical perspective influences the way in which research is conducted and "provides a context for the process involved and a basis for its logic and its criteria" (Crotty, 1999, p.66). In order to understand the phenomena in question, it becomes important, as researchers, to enter into the community to better understand the viewpoint of its members.

Methodologically, the implication of the symbolic interactionist perspective is that

the actor's view of actions, objects, and society has to be studied seriously. The

situation must be seen as the actor sees it, the meanings of objects and acts must be

determined in terms of the actor's meanings, and the organization of a course of

action must be understood as the actor organizes it. (Crotty, 1998, p.75)

Theoretical Framework and Methodology.

With this in mind, the methodological approach taken with this research study will be

of the case study design. This research design was chosen as it allows the researcher to

examine, in depth, the culture in which the phenomena takes place and to enter in, for a time,

the community in question. Through intense study of the setting, individuals involved and

their perspectives on the society they have created, it becomes possible to better understand

how these individuals have modeled informal learning in an online community context. Only

the individuals involved with the creation and maintenance of this type of community can

describe how the community is able to accomplish its mission and the steps taken in order to

understand this mission.

Significance of the Study

Formal education appears to be lacking in its ability to engage students in everyday

learning (Greenhow & Robelia, 2009). With concerns about retention, academic

achievement, school completion, and workplace preparedness, as well as reports of students'

dissatisfaction and disconnection from formal education settings (Greenhow & Robelia,

2009), it becomes increasingly important, as formal education struggles to deal with these

areas, to find and provide alternative areas of learning. As the demands of the workforce

change, it becomes vital for students to not only learn while they are in high school but to

learn the skills necessary to become life-long learners. Online learning communities give students the ability to develop these skills and can provide some of the benefits that appear to be lacking in traditional education settings such as allowing for individual interests to guide the students and for the material to be skill-level appropriate. As more individuals turn to informal and online educational opportunities, it becomes increasingly important for those creating these learning opportunities to have the resources necessary to create effective and worthwhile areas of learning. This research study will provide much needed insight into the formation of informal online learning communities as well as a model to guide the development and evaluation of these communities.

Summary

As online and informal education increases in popularity, it becomes necessary to better understand these types of settings and to become better prepared to offer these learning opportunities. The following chapters will outline the research study conducted to develop a model of informal online learning communities based on theory, research and practice that will assist in the development and evaluation of informal online learning communities. The following literature review will examine definitions of formal and informal learning as well as online learning communities and describe the findings of research in informal and online education.

CHAPTER II

LITERATURE REVIEW

The purpose of this study is to develop a model of informal online learning communities based on theory, research and practice. The literature review will discuss factors of formal learning, informal learning and online learning in order to provide a context for the case study. The literature review will also take a look at current educational models for both informal learning and online learning.

Formal Learning

Learning can refer to a multitude of situations and contexts, but up until the last twenty years, learning has been traditionally associated with formal classroom-based education (Heijden, 2009). *Formal learning* as a term has evolved to incorporate what many individuals refer to as traditional education. A formal learning situation refers to a structured setting, with official instructor-led courses (Walters, 2009, p.51) in which learning is intentional and organized (Helou, Li, & Gillet, 2010, p.179). Formal learning can consist of a variety of programs/options but, according to research, will involve one or more of the following: a specific, prescribed learning framework; organized learning events or packages; the presence of a teacher or trainer; a path to some form of formal

recognition (such as the awarding of a qualification, credit, diploma, certificate or degree); and an external specification of outcomes (Eraut, 2000; Helou, Li, & Gillet, 2010; Hopwood, 2010). Greenhow and Robelia (2009) describe formal education as a formal learning situation in which the students' learning is guided through a formal set of objectives that are generally created by an outside authority. An agent (a teacher, software program or learning management system) traditionally acts as the guide and directs the students' learning. Formal learning can occur during workshops, e-learning programs offered by schools and training departments (Walters, 2009), formal higher education degree programs, K-12 traditional educational settings, and even in the workplace through formalized training situations.

> Historically, formal training and education in the workplace was used to support organizational effectiveness. Formal classroom instruction, on-the-job training, and long-term experience within a relatively static system were the avenues by which management communicated how work was to be performed. (Marsick & Volpe, 1999, p.1)

What is learned inside of school, or other formalized learning situations, can stimulate interest in a particular topic or subject, motivating individuals to "seek more information, opportunities, and like-minded people" (Greenhow & Robelia, 2009, "Exploring the learning", para. 4) with whom they can learn and grow outside of a traditional, formal setting. Conversely, what is learned outside of formal educational settings can influence what is learned within by sparking interest in a particular topic, which can lead to the selection of a certain set of courses, projects, or workshops. This perspective is referred to as a *learning ecology*. (Barron, 2006; Greenhow & Robelia,

2009) According to Greenhow and Robelia (2009), the learning ecology perspective can help to bridge the gap between what is learned at home, in school, at work or within the community. A learning ecology is defined by Barron (2006) as the "set of contexts found in physical or virtual spaces that provide opportunities for learning" (p. 195). Barron (2006) indicates that the concept a of learning ecology stipulates that:

(1) adolescents are simultaneously involved in many settings

(2) they create learning contexts for themselves within and across settings

(3) the boundaries between settings can be permeable

(4) and interest-driven activities can span contextual boundaries and be self-sustaining given adequate time, freedom and resources (Barron, 2006, p.199-201)

While this connection between learning within and without school is a popular perception, van der Heijden, Boon, van der Klink, and Meijs' 2009 study sought to answer, among other things, what relationship exists, if a relationship does exist, between formal and informal learning. Their findings did not demonstrate a significant link between formal and informal learning indicating, to them, that these learning situations are, in fact, two separate phenomena (p. 32).

Informal Learning

Formal vs. Informal Learning.

In order to better understand how informal learning situations play into the role of education as a whole, it is important to understand the differences between formal and informal learning. We can compare informal and formal learning to riding a bicycle versus riding a bus. Those who ride the bus are taken on a journey that is led by the bus

driver. Passengers are along for the ride ending at a pre-determined destination by way of the bus driver and the specific bus route. This is much like students in a formal education setting who are guided through education by an instructor, ending at a pre-determined place (diploma, certificate, etc) by a specified route (curriculum standards, lesson plans, etc). Bicyclists, on the other hand, have much more control of their journey. They choose the destination and route, and even have the ability to alter their journey in an instant. Informal learning allows individuals to make their own journey down an educational path of their choosing. (Walters, 2009)

Research from the last couple of decades has shown that informal learning, in certain settings, can better prepare individuals for their future jobs and professions. According to Verespej (1998), "the core finding of the teaching research report is that 62% of what employees need to know to do their jobs is acquired through informal learning in the workplace" (p. 42). This is demonstrated further in other research, which shows that most learning does not occur in formal settings but through informal settings, both inside and outside the workplace (Marsick, 2006; van der Heijden et al., 2009) and that the impact of formal instruction and training can be marginal as informal interactions with peers become the predominant way of learning (Boud, 1999; Boud & Middleton, 2003; Garrick, 1998).

Definition of Informal Learning.

According to Walters (2009), informal learning is typically "unregulated and unsponsored" (p. 52) while Boud and Middleton (2003) contend that it is simply the learning that "occurs unprompted by deliberate facilitation" (p. 194). Unlike formal education, which occurs in schools, universities or some other formal training situation,

informal learning can take place in a much wider variety of settings giving greater flexibility and freedom to learners (Eraut, 2004; Lima et al., 2010). By recognizing the social significance of learning from others (Eraut, 2004), the continuous process by which "attitudes, values, knowledge and skills are acquired from daily experiences and educative influences" (Walters, 2009, p.51), and the importance of learning as, not a special activity, but an aspect of everyday life (Gray, 2004; Lave 1991), informal learning allows individuals to learn as they go about their daily activities in work, at home, or in other spheres of life (Center for Workforce Development, 1998). Considerations of learning experiences should not be confined or limited by the environments that promote learning as their core purpose but should be expanded to include learning that occurs unofficially, unscheduled and is driven by people's choice, preferences, and intentions (Billet, 2009; Eraut, 2004; Hopwood, 2010; Walters, 2009).

Just as a variety of definitions are given to explain informal learning, various researchers also use the term *informal learning* in different ways. Greenhow and Robelia (2009) describe three forms of learning: formal, non-formal and informal learning. Formal learning situations occur when some agent directs the students' learning guided by a set of formal objectives determined by an outside authority. Non-formal learning occurs when one has a particular set of objectives in mind and takes it upon ones self to actively seek information in order to accomplish these objectives from non-formal sources that could include peers, media or mentors. Informal learning refers to "spontaneous, experiential and unplanned" learning and is brought about by engaging with a variety of informal learning processes and resources.

Marsick and Volpe (1999) proposed a set of characteristics that has been widely

accepted by many scholars (van der Heijden et al., 2009). These six characteristics

provide boundaries for what is considered informal learning by proposing that informal

learning is: (1) integrated with work and daily routine; (2) triggered by an internal or

external jolt; (3) not highly conscious, (4) often haphazard and influenced by change; (5)

an inductive process of reflection and action; and (6) linked to the learning by others.

(Marsick & Volpe, 1999; van der Heijden et al., 2009)

Other researchers feel differently about the boundaries of informal learning. Eraut

(2004) describes informal learning as learning that "comes closer to the informal end than

the formal end of a continuum" (p. 250). Characteristics of the informal end of the

continuum can include "implicit, unintended, opportunistic and unstructured learning and

the absence of a teacher" (p. 250). The inclusion of terms 'incidental learning', 'non-

formal learning', 'implicit learning', and 'accidental learning' are closely related to

informal learning research but contribute to the confusion surrounding a firm definition

of each. It is important to identify in what way these terms contribute to the knowledge of

informal learning.

Informal Learning Terminology.

Typology of Informal Learning.

Eraut's (2004) typology of informal learning leads to a better understanding of

how each term relates to the different aspects of informal learning. Eraut (2004) describes

three types of informal learning; implicit, reactive and deliberative learning. *Implicit*

learning refers to the development of knowledge "independent of conscious attempts to

learn" and occurring in "the absence of explicit knowledge about what was learned" (p.

250). *Reactive learning* occurs in unplanned, or spontaneous, ways. Reactive learning is

intentional but occurs during action when there is little time to think, or reflect, about what is being learned. *Deliberative learning*, on the other hand, involves explicitly setting aside time in which to learn and engage with activities relating to problems or tasks that the learner must accomplish, typically when these problems are related to work (Eraut, 2000; Eraut, 2004; Hopwood, 2010). This typology refers specifically to the intentionality of the individual to learn.

Incidental and Accidental Learning.

Additional terms to consider within informal learning research are the terms *incidental learning* and *accidental learning*. Marsick and Watkins (1990), define incidental learning as a subcategory under informal learning. Incidental learning is a "by-product" of some other activity, such as "task accomplishment, interpersonal interaction, sensing the organizational culture, trial-and-error experimentation, or even formal learning" and almost always occurs even though people are not always conscious of it (Marsick & Watkins, 1990, p.53-54; Heijden, 2009, p.21).

Helou, Li, and Gillet (2010) use the term *accidental learning* to identify a learning situation very similar to incidental learning. According to them, accidental learning is unintentional, occurring in environments in which learning is not the main focus and is not typically structured in terms of objectives, time, and support. (p. 179) Accidental learning, therefore, occurs when learning is not the explicit intention of the learner and can occur as a result of other actions or events not directly associated with a learning event/situation.

By considering both the definition of *incidental learning* and *accidental learning*,

we can conclude that these terms are referring to the same experience within informal learning situations. Incidental/Accidental learning occurs absent of conscious thought as a by-product of a particular situation or activity. Additionally, according to this definition, we can compare the terms *incidental/accidental learning* to *implicit learning*. As Eraut (2004) describes *implicit learning* as the development of knowledge "independent of conscious attempts to learn" (p. 250), we can conclude that these terms are referring to the same phenomena within learning experiences and that they are not just closely related, but can be, and often are, used interchangeably.

Informal Learning Defined.

A common definition is necessary, however, for understanding the nature of informal learning as it is referred to in this research context. The National Science Teachers Association (NSTA) defines informal and formal learning as related to K-12 science education. The NSTA position statement (1999) stipulates that informal learning (within a science education context):

- complements, supplements, deepens, and enhances classroom studies;
- emphasizes creativity through the need to attract non-compulsory audiences;
- does not use a formal set of guidelines, objectives, or curriculum to guide interactions between participants or state what participants should gain from interactions with media;
- extends to the affective, cognitive, and social realms;
- presents opportunities for mentors, professionals, and citizens to share time, friendship, effort, creativity, and expertise with youngsters and adult learners; and
- allows for different learning styles and multiple intelligences and offers

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alternatives for non-traditional and second-language learners.

This definition closely aligns with research on informal learning and provides a context for looking at informal learning within this research.

Factors Influencing Informal Learning.

Informal learning is a growing area among researchers, and the desire to engage individuals in informal learning and make informal learning available to the public has become of increasing interest to groups, organizations and communities across the world. This increase in interest is due to the ability for informal education to resolve the "deficiencies and contradictions" of traditional, formal education and can answer the immediate needs "unsatisfied" by formal learning situations (Lima et al., 2010, p.323). The features of informal learning as an educational approach are appealing but generally misunderstood by the general population or under appreciated by those who have significant knowledge of education as a whole. Many factors are associated with the overall effectiveness of learning and informal learning specifically. It is important to identify and elucidate these factors in order to better understand the intricacies and difficulties surrounding informal learning.

Eraut (2000, 2004) points to the need for informal learning to focus on the particular situation of the learner, with attention on its wider context. He states that it is equally important to pay special attention to differences in personal interpretation and learning. This is echoed by other researchers who state that learning is considered in terms of changing an individual's interpretations of the world or changing the individuals actions within the world (Edwards, 2005) and closely relates to our experiences within the world including interaction with other ideas or people (Billett, 2009). This learning

cannot be predetermined given the differences among individuals and their engagement with what they experience (Billett, 2009; Hopwood, 2010). It is apparent that individual needs and preferences play a significant role in informal learning as is illustrated by the research efforts of Ashton (2004) who found that informal learning in the workplace has different impacts upon individual learners based upon their specific needs. While this particular finding is focused on the effect of learning as a job necessity and how that impacts the individual's learning experience, this can be applied to a variety of settings showing that personal preferences and needs can greatly influence the effect of informal learning efforts. If an individual has no desire to learn, they will not. Sambrook (2006) identified motivation as an inhibiting factor in informal learning. Additional personal factors, directly related to a person's motivation, included lack of time, lack of reward for learning, lack of enthusiasm, and lack of confidence (p. 103).

Eraut (2004) also identified confidence among the factors influencing informal learning. The research conducted by Eraut et al. (2000) and Eraut (2004) shows that confidence, or lack thereof, has an overwhelming importance to the effectiveness of informal learning. It was found that learning at work occurs through "doing things" and being "proactive" in searching for learning opportunities. In order to do this, confidence is required. This confidence arises from successfully meeting challenges one faces and is directly related to the amount of support the individual perceives that they have in that endeavor. According to Eraut (2000, 2004), this produces a "triangular relationship between challenge, support and confidence". "If there is neither a challenge nor sufficient support to encourage a person to seek out or respond to a challenge, then confidence declines and with it the motivation to learn" (Eraut, 2004, p.269). Eraut (2004) identifies

two types of factors that can influence learning in the workplace, learning factors and

context factors. Learning factors, such as challenge and value of the work, as well as

feedback and support, lead to confidence and commitment. The confidence and

commitment level of the individual ties directly into situational context factors, which

can include allocation and structuring of work as well as encounters and relationships

with people at work. This process results in the expectations of each person's role,

performance and progress. (Eraut, 2004, p.269)

Many other factors have been identified as having a direct relationship with an

individual's learning experiences within informal learning settings. Organization size and

sector has been identified to be a factor in that larger organizations (over 250 individuals)

typically offer higher levels of learning intensive jobs (Skule, 2004) and have access to

the resources and capabilities necessary to incorporate learning into the organization as a

whole. In addition, access to and availability of information that is relevant to the

individual can influence the individual's ability and desire to learn (van der Heijden et al.,

2009). Opportunities and time to learn as well as the ability to apply that learning to real-

world situations (Eraut, 2004; van der Hiejden et al., 2009; Sambrook, 2006) can lead to

an increase in motivation to learn. The learning culture of an organization or group can

emphasize the importance of informal learning in that particular setting and can increase

the motivation of those within the organization. A learning culture is created and

maintained when those in charge of the organization make a commitment to investing in

and championing learning in their organizational environment (Sambrook, 2006).

Sambrook (2006), identifies a model of factors that influence informal learning that

includes motivation and confidence; access to materials including content, examples, and

assessment; and the importance of information and communications technology (ICT) materials on informal learning.

Feedback is another important factor contributing to the possibility of informal learning and the impact of that learning on the individual (Eraut, 2004; van der Heijden et al., 2009). According to Eruat (2004), feedback from both supervisors/managers and feedback by peers can be influential in motivating individuals to learn informally. Additionally, commitment of the individual to learning can play an additional role in motivation. "Commitment was soon recognized as a complementary factor to confidence, which affects the extent to which workers are proactive in taking advantage of the learning opportunities available to them" (Eraut, 2004, p.170). According to Eraut (2004), this commitment is generated through the creation of and inclusion in teams or groups of individuals. These groups allow their members the opportunity to meet, observe and work alongside other individuals who may have different experiences and areas of expertise than the individual and allows these members to develop relationships that may provide that necessary feedback, support or advice (Eraut, 2004). A great deal of research has been conducted as to the importance and impact of teams/groups/networks/communities on the informal learning of the individual. This research will be discussed in detail in a later section.

Need for Informal Learning.

According to Marsick and Volpe (1999), traditional education and training assumes that a group can evaluate a task, process or function to determine the ideal way for achieving it, articulate that method and then "prescribe the required skills or expertise that a learner must master to perform that task" (p. 2). With an increased focus on

workplace learning and lifelong learning, it is necessary to rethink what is "traditional" and make available the opportunities for learning that come from areas outside of formal education. Learning does not have to mean that individuals must stop what they are doing and take time out of everyday life and productive activity to learn, learning can be the product of active participation in work, school and life. (Marsick & Volpe, 1999; Wellington, 2001; Zuboff, 1988) "To put it simply, learning is the new form of labor" (Zuboff, 1988, p.395).

Lifelong Learning.

Training, traditionally, refers to a series of separate, planned events that inform people how to conduct very specific jobs or actions. Learning, on the other hand, is understood to encompass an ongoing lifelong process. (Marsick & Volpe, 1999, p.2) According to Helou, Li, and Gillet (2010), "To cope with today's changing world, learning should be pursued actively throughout life rather than be mainly acquired in early life stages and within standard educational systems" (p. 179). Lima et al. (2010) believes that education should make "school knowledge become day-to-day knowledge" (p. 323). This type of learning has become necessary to enable individuals to develop fast and flexible knowledge, as well as sustain both personal and professional development and to allow them to meet the rapidly changing demands of everyday life. (Helou, Li & Gillet, 2010; Marsick, 2006). *Lifelong learning,* as defined by Brandsma (1997), is a continuous process of personal development for everyone, encompassing both formal and informal learning experiences and places demands upon the social structures in which learning takes place. In order to achieve lifelong learning, it is important to conceptualize learning in other settings beyond what is "traditional" (as cited in Sambrook, 2006).

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Lima et al. (2010) relates this need for continual, lifelong learning to exist specifically in the area of scientific literacy. According to Hodson (1998), scientific literacy involves "learning 'science', learning 'about science', and learning 'to do science'" (as cited in Lima et al., 2010, p.323).

Education for an active and involved populace, giving the average citizen knowledge and opportunities that make them capable of dealing effectively with the problems and situations of life, has inevitably to involve scientific literacy. It is intended that citizens develop an adequate perception of science and understand its role and regulation, as part o our common culture. Thus education should make school knowledge become day-to-day knowledge … recontextualized. (Lima et al., 2010, p.323)

A focus on lifelong learning can provide skills and resources necessary for individuals to learn continually regardless of education or location.

Places for Informal Learning.

As, by definition, informal learning lacks the formality of traditional education, informal learning is not confined to the traditional educational setting and can take place in a variety of contexts with no real definition of where this learning might, or should, occur. Current research in informal learning settings is being conducted in a multitude of places with special emphasis being placed upon "education out of school" as well as learning within the workplace.

Education Out of School.

Education out of school is a term used to identify education that occurs informally but, contrary to workplace learning, occurs without a specific context. Education out of school can refer to learning that occurs in museums, science institutes, conferences, art galleries, through field trips, interaction on the internet and social networking sites, family neighbors, chat rooms, instant messaging, help desks and even through professional activities such as supervising and training (Greenhow & Robelia, 2009; Hopwood, 2010; Lima et al., 2010; Walters, 2009). Research is being conducted in many of these settings regularly, but particular focus is being placed upon learning within museums due to the emphasis many researchers place on learning within this setting (Anderson, et al., 2003; Griffin, 1998; Kisiel, 2005; Lima et al., 2010). Field trips have also been identified as a significant place for informal learning to occur. This informal setting allows students, and the other individuals who may be with them, the opportunity to "construct new concepts" and "develop competencies" by visually seeing and/or interacting with the subject that they may be learning (Lima et al., 2010, p.332). "Fieldwork" allows the individual the ability to better understand the subject (Fuller, 2006).

Hopwood (2010) investigated the learning by doctoral students who were engaged in journal editing. This journal editing was a task that was conducted outside of their formalized schoolwork in that the students earned no credit towards their degree and there were no specification of outcomes. The opportunity allowed the students the chance to learn in a setting outside of the "formal pedagogic arrangements of the doctorate" (Hopwood, 2010, Conclusion section, para. 2). The results from the research showed that learning may take place through engaging academic work that is independent of specific

outcomes, the presence of an agent, and the awarding of a certification or qualification. Through this activity, the participants experienced a change in their understandings and actions relating to editing and writing, as well as a change in understanding of their own roles as teachers, researchers, leaders and team workers (Hopwood, 2010). Learning occurred in this context, an area that is not immediately considered when confronted with the topic of educational settings.

Lima et al.'s (2010) study investigated the effect of field trips on individual learning. The purpose of this particular study was to examine whether a "field trip carried out in an informal context could be successful, or not, if organized" (p. 325) according to a specified model. The researchers believed that the field trip under study could help students, and others, to gain geological knowledge and help to develop geological literacy in an informal context. Through the use of interviews and questionnaires, the researchers found that "the activity allowed the participants to better learn 'about science' and to 'understand science'" and that the field trip "seems to have helped students to construct new concepts and to develop competencies that are promoted by the learning of geology and other natural sciences" (p. 323).

Other research has been conducted in museums as well as art galleries and public libraries. Most of the research conducted in informal settings outside of school is focused mainly on experiential learning and learning by doing. While these are important aspects of informal learning, this particular area does not closely align with this research project. Even though the research in these areas does, traditionally, focus on informal education in reference to K-12 educational ages (a focus of this research endeavor), this project

more closely aligns with current research being conducted in the area of workplace learning.

Informal Workplace Learning.

Informal learning can take place in a variety of settings and is especially apparent within workplaces and in the doing of work (Casey, 1995; Hopwood, 2010). Workplace learning brings new perspectives and ideas to the concept of informal learning because it "encompasses a wide range of more or less structure environment, which are only rarely structured with learning in mind" (Eraut, 2004, p.247). Traditionally, education within the workplace has referred to formalized training and workshops. These settings were developed to better prepare employees to carry out specific tasks, sometimes related to their particular job. Research has shown however, that learning at the workplace cannot be separated from the everyday activities involved in work (Eraut, 2004). Much of the learning in the workplace does not occur in these formalized settings but instead, occurs informally (Eraut, 2004; Marsick, 2006; Sambrook, 2006; Verespej, 1998) through a "combination of learning from other people and learning through personal experience, often both together" (Eraut, 2004, p.248) and allowing individuals to apply what they have learned (Verespej, 1998).

It is, with this concept in mind, that we define workplace learning as learning that occurs both *at* work and *in* work referring to the attempt to relate the 'curriculum' to the real work context allowing for individuals to learn through practical experience (Sambrook, 2006). According to Hopwood (2010), there is a lot of literature exploring the effect of learning by doing of work and looking at issues of learning "for or about work in a context removed from work itself" (Workplace Learning section, para. 1). The

workplace is finding, at all levels, the pressure to find new ways to provide learning

experiences to employees within the work setting. According to Sambrook (2006) there

are three levels of workplace learning. Learning 'outside' work refers to learning contexts

such as work-based learning programs, apprenticeships, MBAs, professional programs,

short courses and vocational degrees. Learning 'at' work includes workplace learning that

has a formalized appearance such as health and safety workshops and in-house courses.

Learning 'in' work is learning that occurs as work progress. Examples include learning

while conducting project work, through interacting with multi-disciplinary teams and

through coaching secondments. (Sambrook, 2006, p.98)

   Need for Informal Workplace Learning.

   Learning in and at work is important to all work organizations, large and small, in

order for these groups to remain competitive, and even enhance their competitive

advantage (Moingeon & Edmondson, 1996; Sambrook, 2006). Sambrook (2006) also

states that, if organizations want to achieve productivity and growth, it is necessary for

these organizations to place an emphasis on individual and collective learning in the

workplace.

   Informal workplace learning is equally important to individuals. The changing

professional atmosphere makes it increasingly necessary for individuals to be concerned

about, and work towards maintaining and enhancing one's employability (Billett, 2002;

van der Heijden et al., 2009). The kind of activities and informal learning opportunities

that employees engage in can help to increase employability as these employees become

more knowledgeable and competent in a variety of areas related to their professional

setting and endeavors. "Employability can only be obtained if workers are provided with

important experiences, and if they are able to take advantage of learning new knowledge and skills" (van der Heijden et al., 2009, p.23).

Informal Workplace Learning Settings.

Although much learning in the workplace happens spontaneously (through casual interaction with colleagues or through the solving of complex problems) and sometimes even occurs unconsciously, creating conditions within the workplace that are informal learning appropriate, can increase the "amount, quality and outcomes" of that learning (van der Heijden et al., 2009, p.21). This implies that the organization should provide opportunities for individuals to practice and extend their knowledge and capabilities that are related to their work context (Pulakos et al., 2000). Through challenging work assignments in which demands are placed on the employee that are "broad and complex" (van der Heijden et al., 2009, p.23), and through a variety of informal learning opportunities that can range from the formation of teams and mentoring, to communicating with colleagues (Verespej, 1998), individuals have the opportunity to increase their personal autonomy and to explore opportunities for alternative strategies and solutions to these complex problems (Amabile at al., 1996; Holman & Epitropaki, 2001; Maurer et al., 2003; van der Heijden et al., 2009). Informal workplace learning allows individuals to learn skills that are necessary in today's workplace and covers four distinct, yet overlapping, areas of skill acquisition:

- The skills and knowledge necessary to complete one's job successfully, everyday;
- The ever-important skills such as critical thinking and problem solving, as well as the creativity to solve unique problems;

- Interpersonal skills that allow individuals to work well with colleagues, managers, or customers with differing personalities; and

- Cultural information that give employees the opportunity to contribute in accordance to corporate expectations. (Verespej, 1998, p.42)

For many organizations, informal workplace learning can occur through a variety of activities such as meetings, customer interactions, supervision, peer-to-peer communication, mentoring, documentation, site visits, or even through the everyday execution of one's job (Marsick & Volpe, 1999; Verespej, 1998; Walters, 2009, p.52). Arc's research found 13 major "types" of informal learning in order of importance: (1) teaming, (2) meetings, (3) customer interactions, (4) supervision, (5) mentoring, (6) shift changes, (7) peer-to-peer communication, (8) cross-training, (9) exploration, (10) on-the-job training, (11) documentation, (12) execution of one's job, (13) customer site visits. (as cited in Verespej, 1998, p.44)

ICT and Informal Learning.

Informal learning has become an increasing area of interest in recent years. It has been seen, in the past, as a cumbersome project to endeavor for more settings, however, in that there had been little access to the capabilities necessary to allow individuals to direct their own learning or to make the resources available for them to do so. With increasing access/interest into information and communication technologies (ICTs), which includes a variety of technology including the Internet and elearning materials, emerges a new wave of opportunities for both students and employees as they turn to these technologies as learning tools both inside and outside of their formal educational

settings (Greenhow & Robelia, 2009; Helou, Li, & Gillet, 2010; Sambrook, 2006; Walters, 2009).

With the increasing availability of technologies, both formal and informal settings alike are turning to these technologies to enhance the learning experiences of their students. There appears to be, however, a difference in the way in which these technologies are utilized in the different settings. Levin et al., (2002) conducted a national survey of US teens who reported that there is a 'digital disconnect' between what they do in school and what they are doing at home, stating that they have limited use of the Internet in school when compared to the use of the internet outside of school. These findings go against what is suggested by Marsick's (2006) who states that, "learning is enhanced through the Internet, which provides abundant information and the advantage of speed" (p. 52) leading to the conclusion that both formal and informal settings could benefit from the use of the Internet as a resource and tool. Beyond just Internet use, Spires et al., (2008) reported that middle school students suggest that more 'creative', 'interactive', and 'media-oriented' use of technology in school activities and assignments would lead to an increase in their engagement while in school (p. 511).

While students see ICTs as valuable resources within the school setting, they appear to be more interested in their use outside of school, in informal settings. Indeed, a large amount of students regard ICTs as information-gathering tools that are useful in completing school work but are much more interested in using these technologies for communication and collaboration which are largely employed outside the school setting (Greenhow & Robelia, 2009; Livingstone & Bober, 2004; Spires et al., 2008). These findings suggest that ICTs can have a large impact outside of formal educational settings

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and could potentially lead to an increase interest and access to informal learning opportunities. Sambrook, (2006) states: "the growing supply of computer based learning materials might provide accessible, flexible and affordable solutions, addressing organizational, functional and individual factors that appear to inhibit learning" (p. 100). This flexibility is vital for informal learning to occur.

Walters (2009) states that informal learning is an intrinsic part of the workplace environment and typically plays a much larger role than individuals usually realize. The emergence of Web 2.0 tools has given employees the ability to take "responsibility for their own destiny" and has lead to informal learning becoming "progressively more important throughout the years" (p. 52). These Web 2.0 tools have allowed individuals to become more interactive in their use of the Internet and these applications "successfully trigger contribution incentives, foster user generated content and facilitate information dissemination". The wide acceptability of the Web 2.0 tools commonly available has led to an increased motivation to use these technologies to support informal learning (Helou, Li, & Gillet, 2010, p.179). The Internet, Web 2.0 tools and other resources such as Google, discussion forums, blogs and wikis have given individuals the increased ability to access and interact with information (Walters, 2009) and have allowed these same individuals more choice and flexibility in choosing their learning situations and content. Technology has changed the way in which individuals access and use information leading to a direct impact on both formal and informal learning situations.

The Role of Communities/Networks in Informal Learning.

Learning from peers has been shown to be a predominant mode of learning within the work setting and within informal learning. Individuals typically develop contacts to

whom they reach out to when learning is explicitly needed. These contacts can be

determined due to structural relationships, such as learning from an assigned mentor,

partner or boss, or can be determined through informal situations such as casual

encounters with fellow employees, peers or even through the identification of an informal

mentor. Through analysis of interviews and an examination of social networks, it was

found that informal networks play a significant role in the informal learning of

individuals (Boud & Middleton, 2003). It has even been suggested that the development

of a network of resources within one's organization is directly related to an employee's

success within that organization (Bozionelos, 2003 as cited in van der Heijden, 2009).

Eraut (2004) suggests that these networks can be created and sustained through the

development of a group climate for learning giving the members of the group the ability

to work as a team through collaboration. This 'learning environment' of collaboration can

lead to an increase in competitive advantage as well as innovation, productivity and

growth by giving the individuals the opportunity to use feedback and encouragement to

share learning experiences (Sambrook, 2006, p.97-98). Eraut (2004) found that

participating in group activities and working alongside others, allowed people to "observe

and listen to others at work," giving them the opportunity to learn some "new practices

and new perspectives" and to "become aware of different kinds of knowledge and

expertise" (p. 265-267). According to Wenger (1998), these communities are embedded

in the everyday procedures of the workplace and, in addition to helping to create identity

and meaning, social participation in these communities can also develop informal

learning. This social participation is, in fact, the key to this development and can

complement and substitute for formal learning experiences (Boud & Middleton, 2003; Wenger, 1998).

Online Communities and Informal Learning.

Technology has had a role in the creation of these specialized networks and communities by providing the means necessary for individuals to communicate at a time of their choosing. Networked social media, or social networking tools, such as blogs, Twitter, Facebook, MySpace and more, are positively transforming the face of business and communication practices today (Gratton 2007; Greenhow & Robelia, 2009). This has led to an increased interest in how these same technologies could enhance learning experiences in both formal and informal settings (Greenhow & Robelia, 2009).

It is through these technologies and other Web 2.0 tools that the opportunity has been made available for the creation of online communities in which individuals can interact with each other in an online context. Within a work setting, the development of online communities can allow employees the means to create a culture of knowledge-sharing, allowing individuals to collaborate and communicate experiences without expending others' time and productivity. A typical drawback of informal learning within the work context is that the informal learning experiences can take time away from the colleague or expert as it is usually asked at a time of the learner's convenience and not at the expert's convenience. By creating a structured online community, individuals can post questions or search for answers as they are needed while experts and mentors can add additional knowledge and advice (Walters, 2009, p.53).

Communities of Practice.

The discussion of online communities in the work context typically leads to a discussion of what are termed, *communities of practice*. In fact, while investigating an online community developed within a particular workplace setting, Gray (2004) found that "the online environment did function as a community of practice, where online participation not only served as a tool for informal learning situated in the context of coordinators' everyday work experience" (p. 25). A common misconception, however, is that every online community created can be considered a community of practice. This is contradicted by active researchers of communities of practice including Wenger (2001), who identifies communities of practice as "a group of people who share an interest in a domain of human endeavor and engage in a process of collective learning that creates bonds between them" (p. 1). This, however, is still fairly generic and can lead to confusion as many online communities have been established to develop interaction with a group of individuals in whom there is a common area of interest. Gray (2004) helps to further define communities of practice by identifying three main ways in which communities of practice differ from other communities:

> First, they focus on a domain of shared interest, and membership implies a level of competence and knowledge of that domain that distinguishes members from other people. Second, they interact and learn together by engaging in joint activities and discussion, helping each other, and sharing information. Third, they develop a shared collection of experiences, stories, best practices, and ways of solving problems. This shared repertoire of stories and case studies becomes a common knowledge base on which they can draw when facing new situations. (p. 23)

Gray (2004) also states that communities of practice contain "multiple levels and types of participation" and that the interaction between newcomers and more experienced members is a vital dimension of the community. These interactions allow experienced members to pass along knowledge and facilitate the newcomers' creation of "new knowledge and insight." We may be central participants in one community of practice while we watch from the periphery of another and can move back and forth through each (p. 23). Gray (2004) identifies one additional aspect that defines a community of practice identify the ability for these communities to provide members with a way in which to create personal identity as well as a means for "making sense of and understanding their work" (p. 27). Marsick (2006) contends that much informal learning in organizations takes place through "organic or facilitated" communities of practice, which include individuals who "pursue common job or life-related interests across departmental, organizational, lifestyle, geographic boundaries" (p. 52).

Wenger's (2001) framework suggests that professional associations have the potential to enhance and facilitate informal learning within communities of practice, because, despite the informal nature of the interactions that occur in these communities, they do provide a space for members to learn together through the sharing of stories and engagement of join problem-solving. These communities also allow newcomers to become familiar with their communities culture and for all members to shape their personal identity as practitioners and the identity of the practice itself.

While communities of practice can, indeed, play a large role in many organizations, without a clear definition of these types of communities, confusion can occur as to the place of these types of communities within the informal learning context.

Communities of practice can be viewed as a sub-type of online communities, and the importance of partitioning communities of practice within the general world of online communities can lead to a greater understanding of the impact and role of online communities to informal education overall. Online learning and the development of online communities in both formal and informal education has become of increasing interest in today's technologically advanced world and the following section will detail the role of online learning on current educational practices and, specifically, look at the necessity for online communities and their impact on informal learning.

Online Learning

Online learning has a strong base in formal educational settings. Much of the research on learning online has been conducted within formal educational contexts, the site where online education was first viewed as a viable alternative to traditional face-to-face instruction. These settings still focus on formalized instruction with specific educational goals and objectives drive the focus of these courses. It is important to view online learning, even in this formalized setting, as it provides a basis for discussion about how traditional online practices can, and should, translate into informal online settings.

 Introduction.

Distance education is one of the fastest growing facets of educational systems offering learning experiences to a variety of students across the globe. Online learning, in which education takes place either part-time or full-time in an online environment, has become a viable alternative to traditional classroom education due to the rapid expansion of internet-based technologies (Artino, 2007; Moore, 2003; Tallent-Runnels et al., 2006). An online educational environment provides a variety of benefits to both student and

educator, fulfilling and enriching the education of learners from different backgrounds, interest areas, and expertise. The online environment has the capability to satisfy a variety of different needs and expectations (Shea et al., 2006).

Several reasons are indicated in the research for participation in online learning experiences including the convenience, time flexibility, lack of commute, and opportunities to be independent learners (Bickle & Carroll, 2003; Billings et al., 2001; Cooper, 2001; Navarro & Shoemaker, 2000; Perreault et al., 2002; Reissetter, 2004). Even within the workplace setting, a survey indicates that employers note a generally positive attitude to learning in an electronic format as it is seen to be convenient and manageable (as cited in Sambrook, 2006, p.120-121) with additional benefits of greater access, reduced contact time, and reduced time spent off the job (Sambrook, 2006). In addition, Shin (2009) reports that sixty-seven percent of colleges and universities agree "online education is the single significant development and logical long-term strategy for the field of teacher preparation, offering flexibility and convenience by providing learning opportunities to anyone, at anytime, anywhere" (p. 33).

Whatever a student's reason for participating in an online learning environment, there are several agreed-upon benefits to this type of learning situation. Learning online can provide numerous opportunities to practice a broad range of skills enhancing computer literacy; allow for interaction with an "engaging and authentic environment"; obtain and provide feedback to other students; and make sense out of shared experiences (Collis, De-Boer, & Slotman, 2001; Hammond & Trap, 2001; Hoskins, 2005; Krantz & Eagley, 1996; Oliver & McLoughlin, 2001).

According to Ausburn (2004), within a formal context, the new demographics of colleges and universities places adult, part-time learners as the new majority now making up approximately 50% of the American post-secondary education population causing this group to become the fastest growing segment and largest audience for online learning (Ausburn, 2004; Cappelli, 2003; Levine, 2003; Shea, 2002; Symonds, 2003). Many educators feel that online learning can be a viable form of educational delivery and as effective as traditional approaches as long as awareness of, and focus on, appropriate modifications to "traditional", or face-to-face classroom, educational practices (Burch, 2001; Reissetter, 2004) is maintained. The difficulty lies in determining which practices will and will not work in an online learning situation. The recent growth and the need for focus on effective educational strategies for educating online has forced a major shift in educational pedagogy (Artino, 2007). The shift in pedagogy for online education and training comes from moving away from an instructor-centered focus to a learner (student)-centered focus (Artino, 2007; Dillon & Greene, 2003; Garrison, 2003; Gunawardena & McIsaac, 1996; Shea et al., 2006).

Online Pedagogy.

"As higher education faces this strong new competition for large numbers of non-traditional adults, it becomes increasingly important for faculty and administration to identify the needs and wishes of adults as students" (Ausburn, 2004, p.328). Good pedagogy and a focus on pedagogy has been identified as a predictor of student satisfaction, regardless of the technology utilized (DeBourgh, 2003; Dorrian & Wache, 2009; Rudestam, 2004). This shows that while the technology implemented is important,

pedagogy plays a large role in the effectiveness of online education. Good pedagogy can overcome many obstacles presented by poor technology.

Many aspects of pedagogy have been discussed within research and several factors have been presented as appropriate pedagogical approaches within online learning. Researchers agree that a student-centered approach is necessary for online education (Artino, 2007; Dillon & Greene, 2003; Garrison, 2003; Gunawardena & McIsaac, 1996; Shea et al., 2006) and constructivism, which focuses and emphasizes individual differences in learning styles as well as a student-centered approach, is an important foundational concept to embrace (Hoskins, 2005; Musgrove et al., 2001). Learner-centered environments are structured to focus on the strengths, goals, passions and interests of the student rather than the instructor, while at the same time, emphasizing the development of skills, abilities and knowledge that the students can then utilize beyond their classroom experience (Shea et al., 2006).

In order to develop and maintain a student-centered approach in education, it is important for the instructor to act as a facilitator of instruction, not the conveyor of information. As a facilitator, the instructor acts as a guide for students through the information allowing the students to engage and make connections on their own (Mebane et al., 2008; Shea et al., 2006; Shen, Hiltz, & Bieber, 2009). The student, rather than the instructor, is in control of the timing and communication of the instruction (Burch, 2001; Reissetter, 2004). A good facilitator of instruction will draw students in, create an accepting learning atmosphere, provide direction as well as finding and fixing misconceptions (Shea et al., 2006). When an instructor acts as a facilitator of learning, the students are more actively involved with the course (Ivankova & Stick, 2007) and the

increased activity will allow students to own their learning because they are engaging in topics that are meaningful to them, developing a stake in the information and their education (Shea et al., 2006).

While student-centered learning is appealing to many individuals, applying a student-centered approach can be difficult for educators at times. It is important to identify what aspects make an online learning environment successful. Success can be defined as students who are pleased with their online educational experience, who are actively engaged in their education and who demonstrate an increase in knowledge over the course of their online learning experience.

Online Learning Success Factors.

According to Reissetter (2004), in order to maximize the potential benefits of online learning, elements that students believe are needed for successful online learning need to be identified. With these elements in mind, instructors can begin to design effective online educational experiences for their students.

In a study conducted by Artino (2007), 204 personnel of the U.S. Navy who were completing some form of online military training were surveyed. One of the goals of the study was to determine how task value, self-efficacy and experience with online learning can predict overall student satisfaction and perceived learning as well as intention to enroll in future online courses. He found that task value – how much value or importance an assigned task has to an individual – was the strongest predictor of individual satisfaction. This indicates that creating valuable and relevant tasks is important to students. Without these, students place less importance on the assigned activities for a

course resulting in less contribution and effort. Based on his findings, Artino (2007) recommends that instructors consider creating courses that enhance both the students' value of the required learning tasks as well as the students' sense of efficacy to complete the tasks.

Artino (2007) also identified prior experience as an indicator of success within an online learning environment. This supports the findings of Rekkedal (1983), who found that prior experience in non-traditional education has a significant effect on attitudes and behaviors of students enrolled in those courses. Levett-Jones (2005) indicate that student-directed learning can lead to student anxiety and resentment towards the instructor if not employed effectively. Honey (as cited in Sambrook, 2006) indicates that online educators/material developers have an assumption that learners inherently know how to learn effectively in an online format. A study of postgraduate nurses, conducted by Honey (2004) found that not all students have the same abilities using online technologies, and most students were used to the traditional, face-to-face, learning environment (DeBough, 2003). Because of this, it is important for instructors of online learning courses to keep in mind the varying levels of expertise when developing their course, especially if it represents a major change in learning styles for students (Dorrian & Wache, 2009). As students become more comfortable with the online learning environment, their expertise will increase and lead to a more comfortable, relaxing and enjoyable atmosphere.

Learning support is an important factor in online learning success and can include various kinds of instructional support. This support can include assorted types and kinds of resources, techniques and tools (Garrison & Baynton, 1987; McLoughlin, 2002;

Pedaste & Sarapuu, 2006; Winnips, 2000) including orientation, explanations, coaching, task support, inductive questions and comments, social support for interactions, and tools for learning (Roehler & Cantlon, 1997; Gu et al., 2009). The purpose of the Gu et al. (2009) study was to develop effective support for teachers' online learning. Several hundred K-12 educators in China were surveyed and supported previous findings that learning support, in online education, should include different resources and tools to facilitate learning (Gu et al., 2009). Sambrook (2006) also indicates that learner support is important to allow individuals to enhance learning rather than being forced to spend their time dealing with technological problems.

Permanent written records, instructor facilitation in which the instructor is actively involved with the course providing assistance and encouragement, and immediate feedback are all success factors indicated by Mebane et al.'s (2008) study which aimed to "compare the efficacy of face-to-face and online collaborative learning seminars in helping clinical and community psychology majors acquire the professional skills of affective education" (p. 73). Additionally, Reisstter (2004) found that the more often students were able to sense the instructor's presence in the course materials, the more connected to the course and materials the students felt. This follows in line with the findings of Shea's (2006) survey of students enrolled in online courses in one of 32 universities. This study showed that students felt that an increase in perceived teacher presence reflected effective instructional design and organization.

Other student-indicated success factors were organization, clear expectations, ease of use, clear instructions (Billings et al., 2001; Hall, 2002; Moore, 2002; Reissetter, 2004; Shea et al., 2006), time management, personal engagement (Cooper, 2001; Leasure et al.,

2000; Navarro & Shoemaker, 2000; Reisetter, 2004; Rudestam, 2004), shared goals and trust (Rudestam, 2004; Shea et al., 2006). Age has also been indicated as a factor in student success; older students tend to be more responsible for their education and less likely to rely solely on the instructor for specific rules and guidelines, being more willing to strike out on their own educationally (Richardson & Newby, 2006).

Finally, Dorrian and Wache (2009) identified four areas of importance in online learning based upon both students and instructors of blended learning courses responses to surveys over the course of several years: continued systems development; reducing anxiety; both formal and informal evaluation processes; and communication.

Communication.

"Knowledge is a product out of interaction" (Yang 2009). Effective and regular communication is one of the most widely indicated success factors within online education and learning in general. Ausburn's (2004) study of 67 adult students enrolled in online courses at a large university found that other aspects of the online educational experience are also important to students. The questionnaire and self-test indicated that students value options and variety within the assigned tasks. Additionally, it was found that students place a high value on communication within their online experience indicating that effective two-way communication with both instructor and classmates was extremely beneficial and a rewarding aspect to the course. The results of this study are supported by the findings of Artino (2008), Dorrian and Wache (2009), and Dabbagh and Kitsantas (2004), who all indicated that communication was found as a strong success factor within online courses. Gray (2004) reports that a lack of identification

participation, and therefore a lack of communication with other individuals, was a negative factor discovered during the study.

Communication involves both communication with the instructor and communication with fellow students. Communication, in the form of open discussion and discourse among students allows students to learn from one another through interaction, feedback and the testing/refining of positions and ideas (Addesso, 2000; Baglione & Nastanski, 2007; Brooks & Brooks, 1993; Clark-Ibanez & Scott, 2008). Hoskins (2005) study returned encouraging data indicating that dialogue through the online learning environment has a positive influence on student achievement. Clark-Ibanez and Scott (2008) indicates that scholars are in agreement that learning and critical thinking happen best through interaction and discussion with peers allowing for diverse interpretations and requiring that students defend and reform their ideas. In a study by Wang and Gearhart (2006), when comparing lecture versus discussion styles of teaching, knowledge retention with lecture style was significantly less than knowledge retention within discussion-oriented classrooms, with students teaching others being shown as promoting the highest level of knowledge retention. Gray (2004) reports that those who continued to actively participate within the online community environment indicated that they did so because the ability to connect with their peers made their jobs easier as their peers represented a valuable work resource (p. 25).

Communication among students allows for the development of "common ground" which includes "mutual understanding, knowledge, beliefs, assumptions, pre-suppositions, and so on" (Barker et al., 1999, p.33). This common ground allows for students to communicate more effectively and to extract more valuable information from

the conversations. Grounding takes shape differently from one context to the next and is something that allows being reevaluated and reestablished (Paulus, 2009). Grounding can occur quickly in face-to-face interactions through non-verbal behaviors but these cues are not available in text-based, online, communication (Paulus, 2009).

Group Collaboration.

Doering and Veletsianos (2008) state that the more student-centered activities are used by instructors, the greater the collaboration is with other students, which goes hand-in-hand with constructivist learning. Shen, Hiltz, and Bieber (2008) state that collaborative learning is a student-centered and team-oriented approach in which students learn through interaction with others.

Online instructors can and should facilitate social modeling, collaboration and other co-regulation activities to promote student communication and interaction (Artino, 2008; Corno & Randi, 1999; Kollar & Fischer, 2006). Computer Mediated Communication (CMC) or Computer Supported Collaborative Learning (CSCL) tools such as discussion forums, chat rooms, etc. provide the opportunity for group activities and experiences to take place more often, allowing the students to decided when and how often they work and communicate with other individuals in the online learning environment. The shift, from an individual learning model, through programmed instruction, to collaborative learning, though interaction with peers, has been seen due to the surge in these communication tools available to online users (Mebane et al., 2008).

In the past, distance education has been limited in its educational scope restricting students to downloading and uploading educational content with no ability for students to

learn and interact with each other as they would in a traditional educational setting (Bonk & Cunningham, 1998; Howard, Schen, & Discenza, 2004; Olofsson, 2007). The use of virtual teams or groups of students within online learning environments has become highly encouraged due to the communication technologies that are now available to students and educators. These technologies enable group collaboration through multiple communication channels (Janssen et al., 2009; Penzias, 1995; Yoon & Johnson, 2008).

Major reasons for implementing online learning groups are to improve cooperation, collective knowledge, diverse perspectives and resource sharing (Townsend et al., 1998). What differentiates online learning groups from traditional work groups (which rely on physical proximity) is the ability for students to work together and create products together regardless of time zone or location (Lipnack & Stamp, 1997; Putnam, 2001). Shen, Hiltz, and Bieber's (2008) study investigated the use of collaborative exams as a way to increase learning in an online environment. The students were involved in all levels of the exam process from the initial question design through answering as well as grading. Students participating in this study indicated that they used less memorization and rote learning than they would have otherwise. They were also motivated to conduct more in-depth examination of the material and maintained better retention of the material. This is a unique perspective on collaborative learning and group activities. While not practical in all learning situations, online collaborative exams may be a viable option for certain courses and degree programs looking to provide students with more communication and collaboration opportunities.

Userfriendliness.

Sambrook's (2006) study indicates that *userfriendliness,* which is the extent to which the material is easy to use, can be a factor in online learning. Learning materials, when used in a face-to-face classroom, do not necessarily require the same level of userfriendliness as is necessary in an online environment because when face-to-face, the trainer or educator has the ability to explain details that may not have come across during the development of the materials. This, however, is not typically an option in an online format in which the learning materials for the course are accessed independently of the facilitator of the course and where the learner is alone and potentially isolated. Userfriendliness of the materials is even more important when there is the added complexity of new technologies.

Within this same study, Sambrook (2006) identified 11 of the "most important factors influencing learners' judgment of quality" (p. 112):

• Userfriendly – the extent, to which the material is easy to use, with clear instructions,

• Presentation – clear and accurate, with no mistakes such as spelling errors,

• Graphics – the number and quality of pictures and diagrams,

• Interest – whether the material generates interest or is found to be boring,

• Information – the amount and quality of the content, whether there is too little or overload,

• Knowledge – the extent, to which, new knowledge is gained,

• Understanding – whether the material is easy or difficult to understand,

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• Level – whether the material is considered too basic or too deep for the learner's current knowledge and skills,

• Type of learning – for example, whether deep learning or rote learning, or memorizing facts,

• Language – whether the language was difficult to read, using jargons or lacking definitions,

• Text – the amount of text and the balance with graphics.

(Sambrook, 2006, p.112-113)

Online Learning Strategies.

Now that effective online learning strategies have been identified, it is important to focus on bringing these strategies to life. Many instructors understand the underlying importance of the concepts of communication and collaboration, but making these work in an online environment can be a daunting task. Online Learning Communities and Discussion Boards are two main features of online learning have been identified as potential tools to be utilized in promoting communication and collaboration.

Online Learning Communities.

Members of a community, whether face-to-face or online, are individuals who come together with a common identity or purpose. These members must begin the process of negotiating meaning within their particular setting (Oloffsson ,2007).

An exact definition of *online community* is difficult to come across with any amount of regularity (Parr & Ward, 2006; Preece, 2000; Souza & Preece, 2004). Preece

(2000) uses a broad definition of an online community: "a group of people, who come together for a purpose online, and who are governed by norms and policies." Souza and Preece (2004) provide further support stating that the benefits to this definition include its blend of both technical and social issues as well as its applicability to a variety of different types of online communities in that it incorporates both communities that exist solely online as well as those whose community also has a physical presence component. Andrews (2002) further defines the online community as a "virtual social network" that is used to share information about common interests among a group of individuals in a computer supported communication rather than face-to-face interaction.

Members of an online learning community (OLC) have a "joint and cooperative pursuit of educational goals, respect for cognitive diversity" (Shea et al., 2006, p.176) and pursue an active role within the group. Online learning community models allow students to actively engage each other in "ideas and perspectives they hold to be educationally worthwhile, exciting, and provocative" (Shea et al., 2006, p.177). The emphasis on community supports the idea that learning is founded on participation rather than strict acquisition of information (Sfard, 1998), another concept that has a firm foundation in constructivist learning. OLC's have the ability to create communities of individuals who would, under normal circumstances, never meet because of an OLC's ability to cross geographical borders and removing the barrier of time (Oloffsson, 2007).

Potts' (2005) study indicates that information and communication technologies (ICTs) have been seen as tools for community formation and shared knowledge necessary for continued development of an individual. This study, which looks at how online learning environments affect non-native speakers' development of language skills, shows

that individual classroom communities are essential nodes of connectivity and exchange and allow more opportunities for non-native speakers to communicate in a way that is more easily mastered (Potts, 2005). This same concept can be placed with individuals who share a common language. The online learning community allows its members to share ideas, concepts and goals in an easily accessible environment. Through this online community, a virtual space is created that allows individuals to learn and gain insight into the meaning of their leaning (Gray, 2004).

The importance of the OLC, in which the OLC is the environment for communication, is becoming more widely accepted as a key element to the learning process (Im & Lee, 2004). OLCs emphasize communication and group collaboration in an online learning context (Yang, 2009).

Role of the Moderator.

The findings of Gray's (2004) study, which sought to understand the nature of the informal learning that occurred, motivation for participation, and the role played by the moderator in the community" (p. 21) indicated that the presence of an online moderator "helped the community to evolve" (p. 29) and to develop "the sense of a social community" (p. 30). Moderators, or individuals who are acting as coordinators or organizers of the online community, are seen as an important aspect of community development. Participants in the study described the moderator as an important presence "at the beginning, in the middle, and at the end" (p. 30). At the beginning of the development of the community, the moderators were important to provide technical support and orientation to the community, which aligns with other research stating that the online moderator serves as a "trouble-shooter, educator, hostess, chairperson,

facilitator, and community organizer" (Gray, 2004, p.30). The role of the moderator evolved as the community did as the online moderator served as a motivator and focuser during the middle portion of the community formation and at the end when the online moderator served as an "educational facilitator" (p. 30). The participants in the study indicated that the online moderator facilitated learning by encouraging and assisting community members in exploring topics and issues more deeply.

Moderator techniques that were deemed to be effective based upon the interviews and survey responses included: "summarizing, weaving, and nudging the discussion to a deeper level" (p. 31), which helped the members of the community to construct meaning; the creation of seasonal online polls that allowed for quick information gathering and provided an opportunity for members to participate anonymously; scheduling live chats on specific dates; opening new discussion threads as necessary; and sending private emails to thank individuals or to invite individuals to post on a topic related to their personal experiences. As this study was conducted in an informal community, the moderator could not mandate participation but could only encourage members to participate. By employing effective moderator strategies, the moderator was able to sustain the community during the "anticipated ebbs and flows of interactivity" (p. 32) and to facilitate learning experiences.

Discussion Forums.

Student discussion of readings, concepts and ideas is an educational strategy that has been used for years to place greater responsibility on students to learn and understand the material because they will be discussing it with the instructor as well as other students (Baglione & Nastanski, 2007). Most course management systems provide discussion

forum tools within that particular learning environment (Im & Lee, 2004). The most

widely used CMC or CSCL tool is the discussion forum, also sometimes referred to as

the discussion board or bulletin board (So, 2009). Discussion forums use asynchronous

communication as opposed to chat rooms, which rely on synchronous (occurring at the

same time) communication.

Discussion forums offer a few advantages over traditional classroom discussions

as well as other forms of synchronous communication, in that the communication occurs

over a longer period of time, giving students more time to research and reflect upon their

answers and ideas (Baglione & Nastanski, 2007; Potts, 2005). The online discussion

forums also allow for a certain physical anonymity (if not complete anonymity) that may

decrease inhibitions and increase participation especially among students who, when in a

traditional classroom setting, would shy away from communication based upon a fear of

rejection or humiliation (Baglione & Nastanski, 2007). Other benefits that have been

identified include: simplicity of usage, easy access to the discussion forum and the

compatibility to existing educational/discussion practices as perceived by the students

(Anderson & Kanuka, 1997; Guzdial & Turns, 2000; So, 2009). Baglione and Nastanski

(2007) surveyed 102 experienced online education faculty members at a Southeastern

university. Those faculty members surveyed indicated that both the time available for

reflection and physical anonymity available with online discussion groups provide an

environment in which students are able to participate in a more substantial discussion

(when compared to a traditional classroom) and develop necessary critical thinking and

analytical skills. Rudestam (2004) theorized that asynchronous communication, such as

the discussion forums, favor the development of meta-skills, which are important to the

training and scholarly development of professional psychologists as well as other professionals. Online discussion forums allow for students to become active learners instead of passive observers in the online learning environment providing a connection between individuals and an exchange of ideas (Im & Lee, 2004; Potts, 2005). Gray (2004) also indicates that there was significant learning through the sharing of stories and the discussion of problems.

However beneficial online discussion forums appear to be, many issues have arisen. Findings from studies have shown that student interactions in an online discussion are typically "shallow" and lack the depth of thought and reflection desired by the instructor (Artino, 2008; Miers et al. , 2007; Paulus, 2009; So, 2009). Many times, the discussion forum is underutilized and becomes nothing more than a traditional bulletin board in which students post administrative issues and concerns (Dorrian & Wache, 2009; Paulus, 2009; So, 2009) such as technical difficulties or suggestions for meetings times/places. Wenger (2001) indicates that a "rhythm of events" is necessary to allow individuals to reassert their presence over a specified period of time. While he belives that there is a benefit to asynchronous communication, allowing individuals to participate when they can and as they wish, this same benefit can be "the danger of a pure web-based" community in that "it is always possible to participate, but by the same token, there is never a special occasion to participate" (p. 48).

One explanation proposed by some is that students' participation (or lack thereof) is due to a lack of guidance from the instructor (Artino, 2008; So, 2009). Possible solutions have been proposed by many individuals such as, Misanchuk et al., (2000) who recommend making discussion forum postings required and worth at least twenty-five

percent of the overall class grade. Other suggestions include requiring students to post a specified number of responses to questions, prompts and other students' responses in a given period of time (Baglione & Nastanski, 2007); identifying areas of disagreement and provide focus and understanding to the discussion as the instructor (Anderson et al., 2001; Artino, 2008; Shea et al., 2005); providing thought provoking and engaging prompts as the instructor (Bender, 2003; Hara, Bonk, & Angeli, 2000; Sparariu et al., 2007; So, 2009); and providing clear grading criteria (Artino, 2008; Rovai, 2003). Encouraging discussion among students and promoting collaborative assignments in which the students' work towards a specified goal (Artino, 2008; Clark-Ibanez & Scott, 2008; So, 2009) can improve the quantity and quality of student interactions online.

So (2009) conducted a study to determine how groups decide to use discussion forums in an online learning environment that did not require the use of the discussion board. What was found was that this decision is a complex process factoring in the nature of the collaborative tasks and the perceived efficiency of the communication methods available. Those that choose to use the discussion forums had a high level of participation and these discussions were sustained until after the completion of the project but were used mainly to facilitate low level cognitive tasks such as planning, exchanging documents and providing feedback (So, 2009). This shows that choice may play a significant role in the use of online discussion forums and as to how they will be employed.

Hoskins' (2005) study of 110 second-year psychology undergraduates indicated that discussion forum use was highest among the higher achieving students, those students who are strategic, organized and highly aware of academic demands and how to

work towards high academic achievement. Hoskins (2005) also identified that along with a low quality in postings (lack of real cognitive thought) there is also, at times, a problem with low quantity. Students will passively participate (only reading other students' posts) or not participate at all. While sometimes detrimental in an online educational context, this "lurking" can be beneficial when discussing informal online learning environments as Gray (2004) found that many individuals indicated that they "'learned by lurking' and 'picked up ideas' even when they only read the online postings but did not contribute themselves" (p. 26). Many factors can contribute to this low participation in students in online discussions but self-regulation and motivation have been identified as the two main barriers in online discussion participation.

Self-Regulation and Motivation.

Persistence in any type of distance education course can be adversely affected by a variety of factors including family issues, computer literacy problems, technology, and time management (Kember, 1990) and with the shift from instructor-centered to student-centered education found in online learning environments, greater responsibility for learning is falling to the students themselves (Artino, 2007; Kearsley, 2000; King et al., 2001; Schunk & Zimmerman, 1998). Ivankova and Stick (2007) conducted a mixed methods study to determine what factors, both internal and external, affect student persistence in distance education courses.

> This study focused on doctoral students pursuing degrees in the distributed environment, which offered convenience, flexibility and the opportunity to keep regular work and family schedules. Free from the constraints of the traditional

class, [distance education] students could establish priorities, chose suitable time

for studies, and enjoy full-time employment. (Ivankova & Stick, 2007, p.128)

These findings support many theories about the benefits of online learning but

also present a cause for concern. With so much responsibility for participation lying

directly with the students themselves, how will it be possible for the student to

accomplish this task and to stay motivated to continue learning? Ivankova and Stick

(2007) suggest that "students who want to succeed in a distributed learning environment

need to be highly motivated, disciplined and organized to successfully balance studies,

work, and families" (p. 129), and indeed, many students who choose to participate in

online educational settings would describe themselves as self-directed learners (Garrison,

2003; Leasure et al., 2000). In order for students to be successful in an online learning

environment, they must have a high level of self-regulation and motivation.

Academic self-regulation refers to the way in which students adapt their

cognition, motivation and behavior to improve learning (Artino, 2007). In many cases, a

high correlation between self-regulation and academic achievement is seen (Pintrich,

1999; Pintrich & Garcia, 1991; Schunk, 2005). Self-efficacy, as defined by Bandura

(1986), is "people's judgment of their capabilities to organize and execute courses of

action required to attain designated types of performances" (p. 31). According to Schunk

(2005), those learners who are identified as self-regulators tend to have higher self-

efficacy for learning as well. Self-regulated learners are those individuals who are active

participants in any environment and establish a productive working atmosphere (Artino,

2008). Schunk (2005) also identifies that students who place a high value on the tasks

assigned, are more likely to utilize self-regulation techniques which include: organizing

and rehearsing information, using resources effectively, seeking help; and maintaining a positive outlook on their capabilities and the value of learning.

In order to help students develop and maintain high levels of self-regulation and motivation, instructors can help set reasonable and obtainable goals as well as develop assignments that are meaningful to their education (Artino, 2007; Artino, 2008). Providing students with timely, honest and explicit feedback on their tasks will also increase the student's desire to use self-regulation tools (Bandura, 1997; Bangert, 2004; Wang & Lin, 2007) and using up-to-date online grade books will encourage self-monitoring and self-evaluation as well (Artino, 2008).

> The concept of motivation can be defined as the organized pattern of a person's goals, beliefs and emotions that the person is striving for. Motivation is force to arouse, give direction to, continue and choose a particular behavior. (Lim, 2004, p.164)

Online and Informal Learning Connection

What differentiates online learning from traditional formal learning is that online learning focuses on the instructor acting more as a guide than an actual instructor. They facilitate rather than lead. Also, online learning allows students to learn on their own time, at their own convenience. Because of this, online environments are an ideal place for informal learning to occur, as both the ability for moderators to facilitate learning and allowing individuals to learn at their own time, are essential to effective informal learning situations.

As the previous information has shown, online environments are ideal places for

informal learning to occur as many success factors within online learning environments

directly matches, or closely identifies with, informal learning practices. However,

research within the area of online learning has focused significantly on formalized online

educational settings while research into informal online communities is traditionally more

interested in social learning contexts or communities of practice, neither title which truly

identifies the informal learning environment of interest in this case study. Aspects of each

of these areas of study can, however, be used to identify factors necessary for informal

online learning communities to be successful in their informal learning endeavors as well

as their ability to create online communities that are vital to enhancing online learning

experiences.

Learning Models

Several models and frameworks have been proposed for various learning settings

and contexts. Tables 1 and 2 illustrate some of the learning models that have been

presented in the literature for informal and online learning.

Table 1

Current Informal Learning Models

Title	Author/Year	Description
A Holistic Learning Model	Sambrook, 2006	For informal workplace learning to assist professionals, managers and learners to analyze the factors that both enhance and inhibit informal workplace learning at the organizational, functional and individual levels while examining learning as a holistic model of factors that influence work-related learning. This model synthesizes and organizes the findings from two separate research endeavors and illustrates the link between work-based and computer-based learning.
Period of Performance	Eraut, 2004	A dynamic model that examines learning experiences in

terms of periods. A period can refer to a lesson, a clinic session, a shift or a day depending upon the particular focus and situation/context with which this model is used. An advantage to looking at learning as a period of performance is that situations often develop over time leading to the development of this dynamic model in which "a constantly changing environment provides a changing input that leads to the constant modification of plans" (p. 257). This is opposed to a static model in which all decisions and plans are made at the beginning of a period of learning or performance.

Single and Double-Loop Learning Model	Marsick, 2006	In this model an individual's intentions are guided by their "assumptions, values and beliefs" which frame how they perceive the world around them. When they are going through the double-loop of learning, individuals will "re-visit" these assumptions as they make sense of a situation and as they make decisions about their intentions and objectives. Intentions guide actions, which produce outcomes. Sometimes, to reach the goal, an individual may also have to learn how to interpret the context differently, "decide on or implement actions, and evaluate intentional and unintentional consequences" (p. 63-64).
Informal and Incidental Learning Model	Marsick, 2006	A re-conceptualized model based on Chesh's 1998 Model. This model is based on the idea that workplace learning is developed from a "social contract" among coworkers. Different levels of learning are developed over time and become most apparent when examining informal and incidental learning modes because learning in these contexts is not defined and controlled by educators or trainers.
Strategic Learning Model	Marsick, 2006	Strategic learning helps an organization to move towards its objectives as well as to reevaluate goals and strategies in light of new realizations and insights. In order to enhance strategic learning a connection is made between the re-conceptualized informal and incidental learning model and the single and double-loop learning model. According to Marsick (2006), "strategic learning cannot be engaged unless there is a culture that supports inquiry, communication, risk-taking, and learning from one another" (p. 67)

Table 2

Current Online Learning Models

Title	Author/Year	Description
The 3A Interaction Model	Helou, Li, & Gillet, 2010	This model is activity centric and is focused on naming constructs in order to facilitate the discussion between "designers, developers and target end-users." In addition, the model allows for the facilitation of feedback and closes the gap between the researchers from the cognitive science field, the designers that create the system requirements, and the target group who will actually use the end system by accounting for how its concepts are related. This model refers to three main concepts: Actors, Activities, and Assets. The use of SALT within the 3A Interaction Model encourages actors, activities, and assets to be shared, assessed, linked and tagged (p. 181). According to the authors, the 3A Interaction Model bridges the gap between formal and informal learning in online environments and examines the advantages of Web 2.0 philosophy in "encouraging active contribution, allowing and facilitating the sharing of ideas, opinions, activities and resources" (p. 183).
Instructional Strategy Framework	Johnson & Aragon, 2003	The authors hypothesized that "quality learning environments should be based on instructional principles that are derived from multiple learning theories" and in that respect, they "identified a set of instructional principles for online learning environments" based upon a "fusion" of different learning theories (p. 32). From a study of the literature, two conceptual models were developed which were then synthesized into seven general principles that "appear to be critical for quality learning environments": "(1) address individual differences, (2) motivate the student, (3) avoid information overload, (4) create a real-life context, (5) encourage social interaction, (6) provide hands-on activities, and (7) encourage student reflection" (p. 34).
Demand-Driven Learning Model	MacDonald et al., 2001	The Demand-Driven Learning Model (DDLM) is "intended to enhance WBL [Web-Based Learning] programs in order for learners to further their education while working and meeting family responsibilities" and

		is founded on the "observation that employee and employer have similar goals" (p. 20). The DDLM (Figure 8) is made up of five main components: structure; three "consumer demands" which include content, delivery and service; and learner outcomes.
Web-Based Tutorial Authoring System	Janicki & Liegle, 2001	This model was developed through the combination of instructional design concepts from both "educational and instructional technology fields with those of the information systems and web-based design researchers" (p. 61). After evaluating and compiling a series of instructional design concepts, Janicki and Liegle (2001) used research to determine effective web-design concepts which were then combined to form a model of effective web-based tutorials which was titled WeBTAS (Web-Based Tutorial Authoring System).
Reference Model	Seurfet, Lechner, & Stanoevska, 2002	Through combining a media reference model with learning methods identified within online learning communities, the Reference Model was developed for online learning communities with four views as the basic structure; community, implementation, service and infrastructure. The methods of designing an OLC through the Community View would focus on Organizational Design, while the Implementation View would focus on Interaction Design and so on.

Online Learning Best Practices.

While online learning models have been identified, research on online learning

tends to focus mainly on what factors within online learning can be considered 'effective'

and what cannot. Because of this, many articles and research studies refer to what are

termed "best practices". Boettcher and Conrad (2010) specify the ten best practices

intended for a formalized online course and are especially essential for those individuals

who have never taught in an online context before:

    1) "Be present" at the course site – meaning that the instructor of the course

        should maintain an active presence within the course site

2) Create a supportive online course community

3) Develop a set of explicit expectations for your learners and yourself as to how you will communicate and how much time students should be working on the course each week

4) Use a variety of large group, small group, and individual work experiences

5) Use synchronous and asynchronous activities

6) Ask for informal feedback early in the term

7) Prepare discussion posts that invite responses, questions, discussions, and reflections

8) Search out and use content resources that are available in digital format if possible

9) Combine core concept learning with customized and personalized learning

Plan a good closing and wrap activity for the course (p. 36-47)

Summary

The reviewed literature cited in this study shows the large of amount of research being explored in the areas of informal learning and online education as well as the documented benefits of both fields. The review has also shown that there are several models and frameworks previously documented for both informal learning and online education. This information will provide a basis of understanding for the case study and a context for exploring informal learning in an online learning community.

CHAPTER III

METHODOLOGY

This chapter will describe the methodology and data collection procedures used to complete this study. The selection of methodology and procedures was based on the theoretical framework employed and the purpose of the study, which is to develop a model for informal online learning communities based on theory, research and practice.

This research project uses case study methodology as defined by Yin (2009). Contrary to Patton's (2002) description of case study as a form of data analysis or data organization technique, Yin describes a case study in two parts. He first identifies case studies as an "empirical inquiry" in which the researcher "investigates a contemporary phenomenon in depth" and "within its real-life context" (Yin, 2009, p.18). Because the phenomenon being studied and the context in which it is situated cannot always be easily distinguished, the definition of case study as a research method goes beyond just the purpose of the study and identifies the specific data collection and analysis strategies that are employed within the methodology. The case study involves dealing with a distinct situation in which there will be "many more variables of interest than data points" alone resulting in "multiple sources of evidence," which must "converge in a triangulating fashion" (Yin, 2009, p.18).

The term case study is employed in a variety of research endeavors resulting in a vast array of definitions and uses for the term. Without a clear definition to guide researchers and readers alike, many assumptions are made as to what a case study can and cannot do in a research context. For example, many readers associate case study research with a form of qualitative research. While it may be recognized among the vast range of qualitative research choices, some case study research can, and will, go beyond the traditional forms of qualitative data collection using a mix of both qualitative and quantitative evidence. Case study research is also not confined to include the "direct and detailed observational evidence" that characterizes other forms of qualitative research (Yin, 2009, p19). As a research method, case studies are used in a variety of situations to add to the knowledge and understanding of "individual, group, organizational, social, political and related phenomena" (Yin, 2009, p.4).

Yin (2009) describes case study to be the method of choice when answering "how" or "why" questions in which the researcher has little to no control over behavioral events and the event in study is contemporary in nature. The case studies' strength lies in its "ability to deal with a full variety of evidence" which can include "documents, artifacts, interviews, and observations" (Yin, 2009, p.11).

Yin (2009) describes two different case study designs that include both single and multiple-case design. This research project examines a single case because of this particular case's uniqueness within the field. Other potential rationale for studying a single case includes: when the case represents a critical case; when the case is typical or representative; when the case is revelatory; and when the case study is longitudinal.

A concern with the case study approach to research has been over the lack of rigor typically associated with this method. Often the researcher is unorganized, does not follow a strict set of guidelines or has not reflected on how their personal views and background might, perhaps, influence the findings and conclusions of the study. Yin (2009) states, "every case study investigator must work hard to report all evidence fairly" (p. 14). In keeping with this and Patton's (2002) statement that "analysts have an obligation to monitor and report their own analytical procedures and processes as fully and truthfully as possible" (p. 434), the following section will outline, in detail, the research design for this study.

Settings and Participants

Due to the nature of this particular study, research participants included INSPIRE Project Team members and management, as well as external evaluators. These particular individuals have been involved in many aspects of the project since its inception and have intimate knowledge of the inner workings as well as the goals and objectives for the project as a whole. Each individual and their position within the project are described in detail in Chapter 4.

Setting.

The Interdisciplinary National Science Project Incorporating Research and Education Experience (INSPIRE) is a "multitier year-round program designed for students in ninth to 12th grade who are interested in science, technology, engineering, and mathematics (STEM) education and careers" (NASA, 2010). This project, one of the National Aeronautics and Space Administration (NASA)'s national K-12 education programs, gives high school students the opportunity to engage and interact with like-

minded peers and to prepare themselves for a future career at NASA or in STEM related fields. The "centerpiece" of INSPIRE is the Online Learning Community (OLC) which,

> provides a place for INSPIRE students to interact with their peers, NASA experts and education specialists. Through grade-level-appropriate educational activities, chats and discussion boards, students and their families are exposed to the many careers and opportunities NASA has to offer. In addition, the OLC provides the parents/guardians of participating students with resources designed to help them champion their child's education and career goals. (NASA, 2010)

> To be eligible to apply for the INSPIRE OLC, applicants must:

- Be entering the ninth through 12th grade when the school year begins.
- Be at least 13 years of age or older at the time of application.
- Be a U.S. citizen.
- Have a minimum of a 2.5 academic grade point average on an unweighted 4.0 scale.
- Demonstrate the desire and the academic preparation to pursue a STEM-related field of study beyond high school.
- Complete the online application process with all required documentation (NASA, 2010).

The INSPIRE project has, for the past three years, successfully hosted and maintained an online learning community in which informal learning is the focus. Students within the INSPIRE project have many resources made available to them as members of the community including activities designed to promote interest and

knowledge in different areas of STEM education, NASA competition opportunities, chats

with NASA experts, career information and resources, and much more. These resources

are accessed on an as-needed or as-desired basis giving the students the opportunity to

learn and engage with others as they see fit. With the success that the INSPIRE OLC has

experienced, much can be learned from this project about the creation of, and

maintenance of, an informal online learning community.

Participants.

The following individuals were interviewed in order to gather data and greater

insight into how INSPIRE models informal learning in an online learning community.

Principal Investigator.

This individual is a member of the Oklahoma State University's (OSU's) NASA

Education Projects team and works as the principal investigator for the INSPIRE project.

As a member of the OSU team who wrote the original project proposal that was

submitted to, and accepted by, NASA, this individual has intimate knowledge of the

project from its initial development stages. The principal investigator is a vital part of the

INSPIRE project and is present at most meetings and has final decision making authority

within OSU's project area. The principal investigator is also a direct link between the

OSU INSPIRE team and the NASA INSPIRE team providing support to the OSU team

while maintaining relations with the NASA side of the project.

Assistant Principal Investigator.

This individual is also a member of OSU's NASA Education Projects team

working with all four of OSU's NASA contracts. This individual was also a member of

the team who wrote the initial proposal and is present at most meetings. This individual also has final decision making authority within OSU's project area and works directly with NASA's Project Manager and the Centers' Project Specialists to ensure that everything runs smoothly.

External Evaluators.

The external evaluators are contracted to provide unbiased, outside evaluation of the progress of the INSPIRE project for OSU and NASA project team members. These individuals have been evaluating the project since the beginning. The external evaluators create surveys for the OLC members, the project specialists, the SSE recipients, the OSU INSPIRE project team and the SSE mentors. These surveys, along with other data gathered (such as login information, activity usage, etc.) are compiled to give an overall view of the INSPIRE project. The evaluators then compare the results of the data to the INSPIRE's stated goals to determine if the project is on track and in what areas the project needs to focus. This data also helps the OSU team to make decisions about content and can give insight into areas previously unknown to the tem. The evaluators also work in conjunction with the INSPIRE project manager to develop the INSPIRE annual report that is sent to the NASA Education office for review.

Education Specialists.

There are three Education Specialists working with the INSPIRE project. These individuals are responsible for monitoring and working with a specific region with the US; eastern, central, and western. Each education specialist has had previous experience working with the OSU NASA Education Projects, many of which were informal in nature, and have each had formal teaching experience in the K-12 classroom. Along with

other responsibilities, these individuals work specifically with the development and maintenance of the content within the OLC as well as the overall functionality of the program. These three individuals maintain most of the day-to-day functioning of the project and are the main connection between each of the NASA Centers' Project Specialists within their area. Each of these individuals, in addition to working closely with the project specialists and the summer STEM experiences, also has other areas in which they focus. The eastern region education specialist is the lead for the INSPIRE OLC. His responsibilities include: content development; setting up and running weekly blog postings and NASA scientists/experts chats; monitoring the discussion board; and various other aspects of the development and maintenance of the OLC. In addition to working with the development of the online learning community the central region specialist also provide administrative support through the writing of weekly reports, the development of INSPIRE documents including administrative documents, oversees the maintenance and day-to-day operations of the project, and assists in gathering data for the outside evaluators. The western region education specialist deals with the recruitment of students and interested parents and teachers.

Activity Developers.

Activities are a large part of the content that is placed on the INSPIRE OLC. New activities are added weekly to the online learning community that students can complete to learn more about a particular topic or subject area. All activities are developed using NASA approved education materials and with a focus on NASA but can range from aeronautics and moon/mars topic areas to solar system and universe topics. All activities are developed by the INSPIRE Activity Developers and are specifically designed for the

OLC. Some activities are created from scratch and others are adapted from formal, face-to-face classroom materials previously produced by NASA. The activity developers have changed yearly and include individuals who work in other areas of higher education, individuals who work within other areas of the INSPIRE Project and individuals who are contracted to just create the activities themselves. There is only one activity developer working with the project at a time and there have been four different activity developers since the projects beginning. As one of the original activity developers is the researcher for this study, only three of the activity developers will be interviewed.

Exclusion.

Three additional groups play an indirect role in the development of the OLC. The OLC Community Members, the INSPIRE Project Manager, and the INSPIRE Project Specialists. These groups were not interviewed in the course of this study. The following will outline who these individuals are and the purposes for not interviewing each.

OLC Members.

OLC Members includes those individuals who actually participate as members of the online learning community that has been developed. These members include the students who apply, and are accepted, to the online learning community and include 9-12th grade students from across the nation. These students are interested in science, technology, engineering, and mathematics are a driven towards increasing their knowledge and connections within these areas and many will eventually pursue college degrees and careers in these areas.

The rest of the individuals that make up the OLC members groups include the parents of the student members. When a student is accepted into the INSPIRE OLC, they are given a unique login to be able to access the information and opportunities within the OLC and their parents are given a unique login access as well. The parents even have parent specific discussion areas and opportunities, such as parent specific chats, that are available to them to give the parents the knowledge and opportunities to help their students achieve their STEM/NASA education and career goals.

While the OLC Community Members can provide a great deal of insight into the perceptions the community members hold of the community itself, the purpose of this study is to examine the informal online learning model that has been developed compared to previous research and it was therefore not necessary to interview the community members themselves. Survey data has been collected previously as a project evaluation tool and has been summarized in the Annual Program Evaluation Report, which was evaluated in the archival data analysis process.

INSPIRE Project Manager and Project Specialists.

The INSPIRE Project Manager and Project Specialists are NASA employees who work in conjunction with the OSU team to make the INSPIRE project successful. These individuals are OSU's direct access to NASA and NASA's ten centers. The Project Manager is the official project lead. This individual reports to the main NASA education office about the progress and success of the INSPIRE project. He also works directly with NASA and OSU to create INSPIRE's annual budget and to make final project decisions. The OSU team meets regularly with this individual to discuss goals, suggestions, and opportunities to make INSPIRE a better project. While the Principal and

Assistant Investigator have final decision making authority within the OSU area of the project, the INSPIRE Project Manager has final decision making authority for the project overall.

The INSPIRE Project Specialists are a group of NASA employees who work with the INSPIRE project at each of NASA's ten centers. Each center appoints an INSPIRE project specialist to work as the liaison between the Center and OSU. There is at least one project specialist for each of the ten centers while some of the larger centers have two individuals working together. These individuals work extensively with the INSPIRE Summer STEM Experiences by coordinating the selection of the SSE recipients and arranging mentors, tours, and opportunities as well as managing the INSPIRE students while at their Center. The project specialists also work with the INSPIRE OLC by contributing to the content on the site, informing OSU of NASA opportunities and events, and by assisting the OSU team in finding speakers and presenters for chats.

While these individuals have input, suggestions and contributions to the development of the OLC, they are not directly involved in the development of the informal online learning model within the OLC and therefore were not interviewed in this study. Their input was examined during the document analysis process, however, through the examination of the Annual Meeting Notes in which these individuals played a significant role.

Data Collection Procedures

Yin (2009) identifies three key principals of data collection that applies to all forms of data: (1) using multiple sources of data, (2) creating a case study database, and

(3) maintaining a chain of evidence. The ability to access and use multiple sources of data is a major strength of case study design allowing for triangulation of the data. Patton (2002) describes four types of triangulation including: (1) triangulation of data sources; (2) triangulation among different evaluators; (3) triangulation of perspective to the same data set; and (4) triangulation of methods. This particular study will focus on triangulation of data sources allowing for data corroboration through three main types of data; documents, archived data, and interviews.

Data.

Table 3 lists the different data sources that were analyzed as a part of this study along with the rationale for use and the analysis procedure for each.

Table 3

Data Sources and Procedures

Data Source	Rationale	Analysis Procedures
Website	Evidence of the INSPIRE model of informal online learning	Miles and Huberman's Document Summary Form (See Appendix A for a sample form), free code, chunk into themes
Activity Template	The template is used as criteria for acceptance of activity development within the OLC and sheds light on the importance of different aspects of an activity and the importance of these different aspects by the project team.	Miles and Huberman's Document Summary Form, free code, chunk into themes
Annual Meeting Notes	The annual meeting is a time for the OSU portion of the project to report out to other members of the project about the status of INSPIRE for the	Miles and Huberman's Document

	previous year and is used to brainstorm ways to improve and changes that need to be made the coming year. These notes show what aspects of the project are seen as important to the OSU team and the other project members as well as providing insight into the development of the project over the last three years. This leads to additional information about how INSPIRE has reached its current informal learning model and the steps taken to achieve that model.	Summary Form, free code, chunk into themes
Annual Program Evaluation Report	The annual report is created by the external evaluators and is compiled from a variety of resources including login data, account activity, activity completions, points received by participants and surveys completed by INSPIRE participants and their parents. This report gives a comprehensive look at the program overall and can show changes in the program which may provide insight into program goals, objectives, achievements and can also show participant/parent satisfaction with the current OLC and the INSPIRE project as a whole. This will also lead to additional information about how INSPIRE has reached its current informal learning model and the steps taken to achieve that model.	Miles and Huberman's Document Summary Form, free code, chunk into themes
Interview with Principal Investigator	As this individual has been around since the proposal of the project and has played a major role in its development, the Principal Investigator will be able to provide a great deal of insight into the initial goals of the OLC and how the informal learning model has developed over time as well as what the intentions were, are and will be in the future.	Transcribe, member check, free code, chunk into themes
Interview with Assistant Principal Investigator	As this individual has been around since the proposal of the project and has played a major role in its development, the Assistant Principal Investigator will be able to provide a great deal of insight into the initial goals of the OLC and how the informal learning model has developed over time as well as what the intentions were, are and will be in the future.	Transcribe, member check, free code, chunk into themes

Interview with Outside Evaluators (2)	These individuals will be able to provide insight into the achievement of the goals set forth by the project team members and can speak to the success of the implementation of these goals	Transcribe, member check, free code, chunk into themes
Interview with Education Specialists (3)	As these individuals work specifically with OLC content and goal development and have been with the program since the beginning, these individuals will be able to speak directly to INSPIRE's goals and the intentions that the project team members have in relation to the various aspects of learning that are expected to take place within the OLC. They can also provide insight into the development of the INSPIRE model of informal online learning.	Transcribe, member check, free code, chunk into themes
Interview with Activity Developers (2)	These individuals were, at one time, directly involved in the development of the activities including decision making in regards to the content topics addressed within the OLC and the ways in which the content was presented and how participants were evaluated. Each individual worked at different times within the project, which can provide insight into the changes, and developments that were made over time and the process taken to achieve the current model.	Transcribe, member check, free code, chunk into themes

Data was gathered through the collection of the documents described above, from the individuals in possession of those documents. Additionally, interviews were conducted following the document collection.

Interviews.

While useful and valuable information can be obtained through documentation and archival records, additional information can be gleaned through the use of interviews. During interviews, it becomes possible for a clearer, more thorough and more concise explanation of ideas to be conveyed to the researcher. According the Patton (2002) "we

interview people to find out from them those things we cannot directly observe" (p. 340).

It is not possible to observe everything that is of potential interest to the study including

feelings, thoughts and intentions. "The purpose of interviewing, then, is to allow us to

enter into the other person's perspective". (Patton, 2002, p.341)

Yin (2009) describes three types of interview approaches; in-depth interviews,

focused interviews, and a survey interview. For this study, focused interviews were used

as a means of data collection. An individual is interviewed for a shorter period of time,

typically an hour, in a focused interview. The interviewer will typically maintain a

conversational approach and tone but will be focused on a specific set of questions. This

will allow for the interview to corroborate information gleaned from other sources. (Yin,

2009) This study used the Interview Guide Approach as discussed by Patton (2002). This

approach involved the development of an interview guide with pre-determined

generalized questions in an outline form. The actual order of the questions, as well as the

exact wording to be used was decided upon during the interview (see Appendix B for

sample interview questions). This approach allowed for the systematic collection of data

specifically sought for by the researcher but also allowed the interviewee to provide

additional insight into areas that may have been overlooked in the initial question

development. Additionally, the interviewees were able to bring their particular areas of

interest and knowledge to further develop the interview. This allowed the interviews to

remain conversational and more relaxed which allowed the interviewees to feel more

comfortable and respond more freely.

For this study, interviews were conducted with two external evaluators, the

project's principal investigator and assistant investigator, and project team members

whose responsibilities lie in the production and maintenance of content within the NASA INSPIRE OLC. Those chosen for interviews were contacted via email to set up a time and place for the interview. Most individuals of interest live and work outside of the immediate area. Those who could, were interviewed in person, while others were interviewed via an Internet technology, Elluminate® conferencing software. All interviews were audio recorded for transcription purposes and then transcribed verbatim. These transcripts were analyzed along with the documentation and archival records.

 Confidentiality.

 According to Patton (2002), "the confidentiality of program records, particularly client records, must be respected" (p. 294). All implied confidentiality of individuals was maintained during the data collection and presentation portions of this research. Confidentiality was maintained by de-identifying all records, when possible, prior to evaluation and, in cases when de-identification was not possible, records were available only to the researcher. As data was collected, a database of information was gathered and maintained on the researcher's personal laptop with a backup located on an external hard drive secured at the researcher's home. All data access points were secured through the use of passcodes that will prevent others from accessing any information. Additionally, when data and findings are presented group generalizations will be used when possible, when not, pseudonyms are used in order to protect the privacy of individuals who participated in the study.

Data Analysis

 Data Triangulation/Reliability.

According to Patton (2002), triangulation serves to provide diverse ways at looking at the same phenomena and can add creditability about the conclusions drawn during the data analysis process. Triangulation allows the researcher to test for consistency among data sources and allows for illumination when inconsistencies are found. Two different types of triangulation were used during the course of this study: the triangulation of sources, and theory/perspective triangulation. Patton (2002) states that because no single source of data can adequately solve a research problem, the triangulation of sources allows the differences found in each source to illuminate different aspects of the question in study. The triangulation of sources examines the "consistency of different data sources within the same method" (p. 556). Through the combination of interviews, documents and archival records, the weaknesses of each can be overcome and will provide diverse ways in which to look at the same phenomenon. This study will also used theory/perspective triangulation in which the use of "multiple perspectives or theories" (p. 556) allows for additional interpretation of the data.

Document Analysis and Coding Methodology.

Document analysis was conducted prior to interview analysis to provide a narrower question base for the interview structure. Both document analysis and interview analysis were conducted similarly through the use of open coding techniques.

According to Patton (2002), analyzing data is a complex and multi-faceted process in which "we mold interview, observations, documents and field notes into findings" and "the challenge of qualitative analysis lies in making sense of massive amounts of data" (p. 432). In order to make sense of the large amount of data, NVivo® was used to scan the data for patterns, regularities, and relationships which allowed for

the production of coding categories. Coding categories were developed through physical

evaluation of the data and highlighting methods. Open coding (sometimes referred to as

free coding) was used during the initial stages of data analysis. Open coding is a free

coding process in which the researcher develops a "manageable classification or coding

scheme" (Patton, 2002, p.462). This process involved examining, in detail, the data

gathered and identifying, categorizing, and classifying the "primary patterns in the data"

(Patton, 2002, p.462). This allowed the patterns to emerge from the data and provided

insight into what is significant. These coding categories allowed for the production of

themes from which insight and understanding emerged. After the data is coded, the

codes were organized into chunks, which were then further compiled into themes.

Reflexivity

Reflexivity is an analytical process in which a researcher reflects on his/her

stance, position, motivation and various other aspects about the role the researcher has

played within the study. Reflexivity allows the researcher to become more self-aware and

to better position themselves within the context of their study. Being reflexive about your

work allows the researcher to better understand their preconceptions about the study and

provides for an additional level of transparency to the reader. According to Gordon

(2005), researcher reflexivity allows for increased understanding for both the researcher

and readers about "how past experiences and beliefs shape the ways in which stories get

told" (p. 280). Gordon goes on to describe reflexivity as an opportunity for readers to

"challenge the accounts offered to them" (p. 281). Reflexivity can happen at many

different stages within the research project providing for different levels of

understanding. My current research endeavor requires reflexivity from the very beginning

of the project in order to better understand the complications that may arise from my unique position within the project itself. During this paper, I will address the reflexivity process as a researcher and how it applies to my current research endeavor.

My role within the NASA INSPIRE project makes me uniquely qualified to evaluate how the project models informal learning in an online learning environment. As the OLC Administrator, my specific job is relatively fluid. My main responsibilities include developing and maintaining the online learning community and assisting in the development of the content within the OLC that includes chats, blogs, STEM related activities, facts of the day, daily news and the discussion boards. I have been with the INSPIRE project since the initial development stages of the OLC and have moved from the sole content creator to the administrative type position that I hold today.

My participation in the development of the project gives me a unique evaluative position but can provide for some areas of difficulty when it comes time to evaluating the project as well. I have very powerful feelings about the OLC, believing strongly that the OLC has a large role within the project as a whole and is accomplishing its goals as completely and effectively as is possible with the resources available. Because of this, I can become defensive when the OLC is critiqued or if others make suggestions about the future of the OLC. I tend to view it as "my baby" and try to protect it from negative feelings from others and I tend to believe, at times, that only I know what is best for the OLC. I worry that this may cloud my overall findings within the research study. I do believe that the OLC models informal learning in an online context effectively and am unsure as to how I will react if research tells me differently. I also do not want for my

belief as to the effectiveness of the OLC to interfere with the analysis portion of the project.

I believe that my awareness of my inclinations towards defensiveness will allow me to combat some of those initial impulses. Also, having member checks for interviews and having outside individuals review my findings and conclusions will, ideally, reduce some of my particular preconceptions.

My final area of concern lies particularly with my position in the project. As firmly as I believe that we, as a team, are doing a great job in modeling informal learning I am concerned to find that we, perhaps, are not doing as good of a job as I believe. What kind of ramifications will arise if I must tell my bosses that we are not accomplishing what we should? Knowing the individuals who I must report to, they would be disappointed but I do not believe that there would be any significant negative ramifications to this revelation. However, rather than bringing back just results, I will also utilize the results, in correlation with the research, to make recommendations for improvement. This is the type of information that those with whom I work are greatly interested in knowing. This should reduce my anxiety in the results and what I am reporting, allowing me to delve deeply into the actual results of the analysis rather than feeling that I must "sugarcoat" what I find.

By being reflexive I am giving readers the opportunity to better understand the perspective that I come from when collecting and analyzing data which gives them the opportunity to question assumptions made by me as a researcher. My particular position within the project makes me both uniquely qualified to determine how the project is

modeling informal online learning as I have first hand knowledge from day one but this position can also lead to complications as my personal experiences could influence the findings from the data. Being reflexive allows researchers to better understand their preconceptions about their research and is an important step in the qualitative research process.

CHAPTER IV

CASE STUDY

The purpose of this study is to develop a model of informal online learning communities based on theory, research and practice. This chapter will present data findings in case study format. The relationship between NASA and Oklahoma State University will first be explained followed by a description of the INSPIRE Project after which the INSPIRE Project team will be introduced and ending with a detailed description of the INSPIRE OLC website as well as project limitations.

NASA and OSU's NASA Education Projects

The NASA INSPIRE project consists of two separate groups working together, NASA and OSU's NASA Education Projects. These groups work in conjunction to ensure that the project is successful, meets its goals, and that all aspects run smoothly.

NASA.

The National Aeronautics and Space Administration (NASA) is a federally funded government agency. NASA's vision is "to reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind." To achieve this vision, NASA conducts research and exploration missions in a variety of different areas.

Currently, NASA is focusing on four mission directorates: Aeronautics, Exploration Systems, Science and Space Operations. NASA Headquarters in Washington provides overall guidance and administration to the agency under the leadership of the Administrator. Ten field Centers and a variety of installations conduct the day-to-day work, in laboratories, on airfields, in wind tunnels and in control rooms. Specifically, the INSPIRE project works directly with the ten field Centers commonly referred to as the Centers. These centers include:

- Ames Research Center (ARC) in Moffett Field, California;

- Dryden Flight Research Center (DFRC) in Edwards, California;

- Glenn Research Center (GRC) in Cleveland, Ohio;

- Goddard Space Flight Center (GSFC) in Greenbelt, Maryland;

- Jet Propulsion Laboratory (JPL) in Pasadena, California;

- Johnson Space Center (JSC) in Houston, Texas;

- Kennedy Space Center (KSC) on Merritt Island, Florida;

- Langley Research Center (LRC) in Hampton, Virginia;

- Marshall Space Flight Center (MSFC) in Huntsville, Alabama; and

- Stennis Space Center (SSC) in Missouri.

A part of NASA's organizational structure includes NASA's Education Program. This program is lead by an Associate Administrator and has several additional administrative staff that work to achieve NASA's education goals. Additionally, each NASA Center has an education office. According to NASA, their

journeys into air and space have deepened humankind's understanding of the

universe, advanced technology breakthroughs, enhanced air travel safety and security, and expanded the frontiers of scientific research. These accomplishments share a common genesis: education. As the United States begins the second century of flight, the Nation must maintain its commitment to excellence in science, technology, engineering and mathematics education to ensure that the next generation of Americans can accept the full measure of their roles and responsibilities in shaping the future. NASA will continue the Agency's tradition of investing in the Nation's education programs and supporting the country's educators who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the young minds of today who will be the workforce of tomorrow. (Canright, 2011)

NASA's Education Program works to pursue three major education goals:

- Strengthening NASA and the Nation's future workforce

- Attracting and retaining students in science, technology, engineering and mathematics, or STEM, disciplines

- Engaging Americans in NASA's mission

NASA Education has worked in conjunction with Oklahoma State University through a variety of different cooperative agreements over the past forty years.

OSU's NASA Education Projects.

Oklahoma State University's College of Education (COE) has a long-standing partnership with NASA education. The COE, through an area of the college known as NASA Education Projects, currently manages four different NASA education cooperative

agreements: Digital Learning Network (DLN), Teaching From Space (TFS), NASA

Explorer Schools (NES), and the Interdisciplinary National Science Project Incorporating

Research and Education Experience (INSPIRE). Because this research study focuses on

the INSPIRE Project, a brief introduction of the other projects Is provided to give an

overarching view of where INSPIRE fits into the family of NASA Education Projects.

Other Projects.

Three projects, aside from the INSPIRE project, are contracted to OSU. These

projects include: the Digital Learning Network (DLN) a subset of the LE&RN project;

the Teaching from Space Program (TFS); and the NASA Explorer Schools (NES).

DLN.

NASA's Digital Learning Network began in the spring of 2003 with three sites

and expanded during the following 3 years to include all 10 NASA field centers. The

DLN has reaches close to 1 million students and teachers with videoconferences and

webcasts that feature NASA-related science, technology, engineering, and mathematics

instruction. With standards-based IP videoconference systems and high-speed Internet

connectivity, participants can take advantage of free interactive lessons and professional

development events through distance learning technologies. (Smith-Long, 2010)

TFS.

Teaching From Space consists of a team of former classroom teachers devoted to

helping educators make science, technology, engineering and mathematics, or STEM,

come alive for learners. Each experience and resource offered through Teaching From

Space is intended to be unique and accessible and to provide real-life connections to the world of STEM.

Teaching From Space offers experiences and resources not found anywhere else. Participants can get involved in real NASA missions and research, gain access to NASA experts, and use NASA equipment to take learning to a new level.

In addition to hands-on activities, TFS offers electronic resources designed with busy classrooms in mind. Teachers can quickly and easily find everything they need, from short video clips to lesson plans, to infuse their classroom with NASA-unique content. (Canright, 2011)

NES.

The NASA Explorer Schools Project is NASA's classroom-based gateway for middle and high school students (grades 4-12) that provides authentic learning experiences designed around NASA's unique missions while promoting student engagement in science, technology, engineering and mathematics based on NASA's resources.

NES focuses on student opportunities, giving students a sense of relevance and involvement by linking STEM classroom topics to real-world NASA activities that inspire middle and high school students' interest in STEM disciplines. Through partnerships with national educational organizations and use of best educational practices, the NES project hopes to inspire students to participate in NASA missions and develop their aptitudes in STEM.

NES uses a Virtual Campus website (http://explorerschools.nasa.gov) to provide

professional development and support for educators and allows students to participate in

NASA's missions of discovery and exploration. NES offers crosscutting NASA STEM

content modules for middle school and high school teachers to implement into their

classrooms. (LaSalvia, 2010)

INSPIRE.

INSPIRE is one of four OSU NASA Education Projects contracts between NASA

and Oklahoma State University's College of Education. This project is a two-part

approach to high school learning and education.

INSPIRE Overview.

According to the NASA education website, the Interdisciplinary National Science

Project Incorporating Research and Education Experience (INSPIRE) is a multitier year-

round program designed for students in 9th to 12th grade who are interested in science,

technology, engineering and mathematics, or STEM, education and careers.

Through the INSPIRE Online Learning Community (OLC) the centerpiece of the

INSPIRE Project, students from across the nation have the opportunity to interact with

their peers, NASA experts, and education specialists twenty-four hours a day, seven days

a week. According to promotional materials, members of the OLC discover new

knowledge while exploring their interests through unique activities and challenges;

connect with subject matters experts through weekly chats and blogs, as well as their

peers on an exclusive discussion board; and equip themselves through access to resources

designed to help students prepare for their future as well as information about other

NASA competitions/opportunities. Even parents/guardians have a unique opportunity when their student is accepted into the INSPIRE project by providing them with resources designed to help champion their child's education and career goals.

To ensure all students have an opportunity to participate in the OLC, those who qualify for the National School Lunch Program are eligible to receive a free laptop. To be considered for the INSPIRE Online Learning Community, applicants must:

- Be entering the ninth through 12th grade when the school year begins

- Be at least 13 years of age or older at the time of application

- Be a U.S. citizen

- Have a minimum of a 2.5 academic grade point average on an unweighted 4.0 scale

- Demonstrate the desire and the academic preparation to pursue a STEM-related field of study beyond high school

- Complete the online application process with all required documentation.

Members in good standing with the INSPIRE OLC have the opportunity to compete for grade-appropriate summer STEM experiences. The summer STEM experience is designed to provide hands-on opportunities to investigate education and careers in STEM at a NASA facility or a Space Grant Institution/University. Each summer experience, except the Collegiate Experience, will take place at the NASA facility within the student's service area.

INSPIRE Demographics.

The INSPIRE Project Summer STEM Experiences began in the summer of 2008

with the OLC beta testing taking place during the fall of 2008 and being open to all

accepted OLC members in the spring of 2009. Table 4 presents the number of students

accepted in the INPSIRE OLC by year.

Table 4

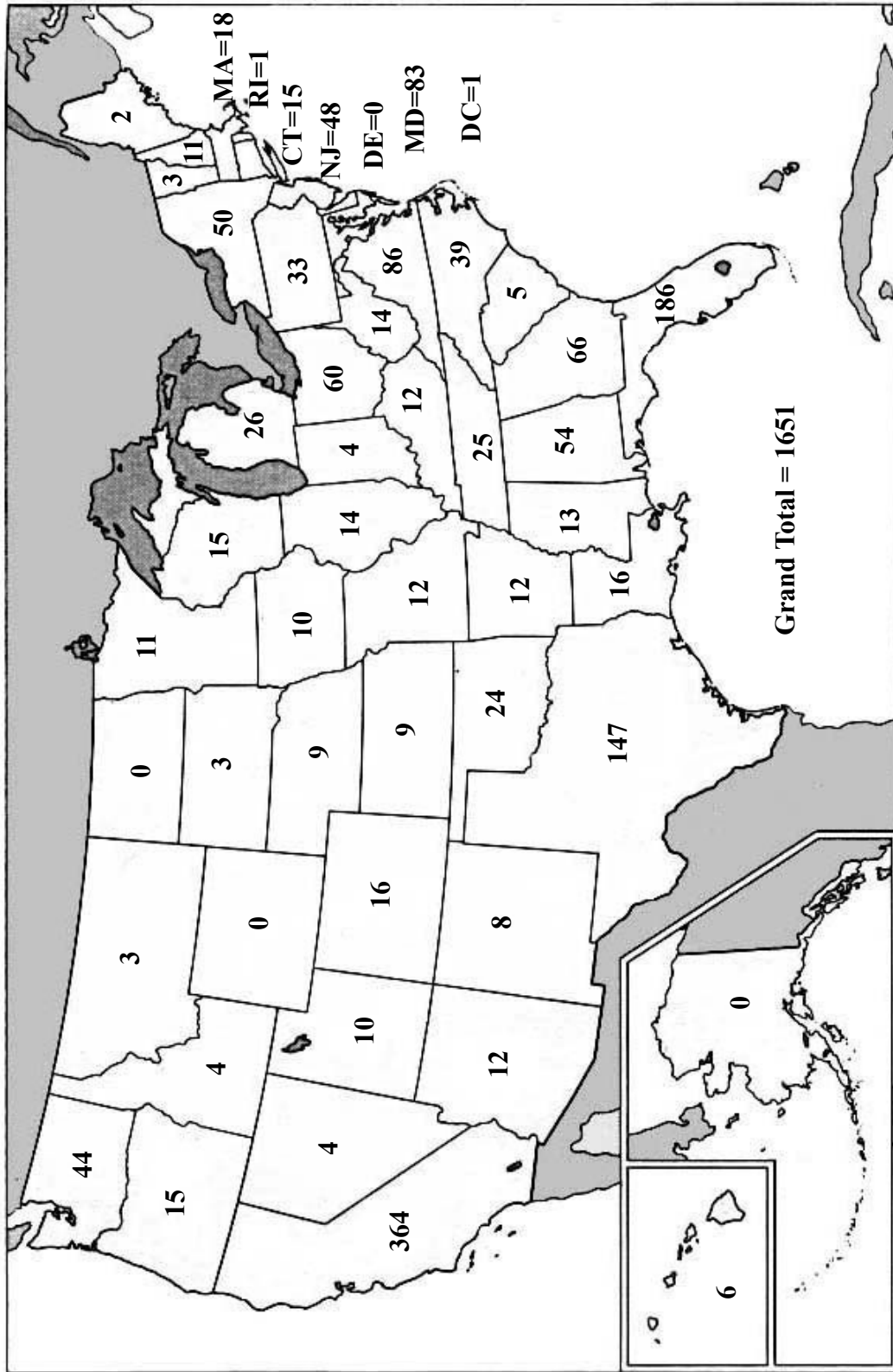*Number of Students by Grade Level for INSPIRE Online Learning Community*

	9th Grade	10th Grade	11th Grade	12th Grade	Total
2008-2009 OLC Participants[a]	193	248	409	400	1250
2009-2010 OLC Participants	322	484	541	438	1785
2010-2011 OLC Participants[b]	275	401	564	417	1657

[a]2008-2009 Totals are for January 2009 – August 2009. [b]2010-2011 Participant totals reflect total registered/active students.

The parent/caregiver of each INSPIRE OLC member also has personal login information.

Figure 1 presents the number of registered/active student participants in the

INSPIRE 2010-2011 OLC by state and U.S. territory.

Active OLC Members
2010-2011

MA=18
RI=1
CT=15
NJ=48
DE=0
MD=83
DC=1

2
11
3
50
33
14
86
39
5
186
60
26
12
66
4
25
54
15
14
13
12
12
16
11
10
9
9
24
147
0
3
9
16
8
3
0
10
12
4
44
15
4
364
0
6

Grand Total = 1651

U.S. Territories: Puerto Rico (21), Virgin Islands (2); Students who are U.S. Citizens but live outside the country (5)

Figure 1. Registered/Active Members of the OLC 2010-2011 by State and U.S. Territory.

INSPIRE History.

Principal Investigator Marsh (PI Marsh), described the INSPIRE Project's early history. In the early 1980's, NASA Education Projects developed the SHARP program, which was an experience for high school students to go to a NASA Center and work on-site, hands-on with a NASA scientist or expert. Oklahoma State did the research and development for the program and then turned it over to another contractor. PI Marsh stated that the concept was good but had its limitations. An example of which is that students were only accepted who were within commuting distance to each of the NASA Centers. The National Research Council (NRC), through the evaluation of government programs, determined that, while some of the elements were good, it needed to be re-evaluated and expanded. The NRC came up with a design that would allow for nationwide participation in this program through several components including an online, consistent part that would be available all the time, and a face-to-face hands-on special component that would be available during the summer. The INSPIRE Project evolved out of the concept blending what SHARP was and what the future needed it to be into a new adaptation. Oklahoma State has been interested in NASA education since the late 60's and has always kept an eye on the developments and changes within NASA education.

In the Cooperative Agreement Notice (CAN) document, NASA sets forth the parameters of the project and requests bids from entities desiring to run the project. PI Marsh explains that these bids describe how each entity would go about implementing the ideas that NASA has presented and how they would operate the project. The INSPIRE CAN expressed NASA's desire of a year-round program and, in addition, NASA expressed an interest in continuing the tradition of offering internships for

students between their junior and senior year of high school and to those who are between their senior year of high school and their freshman year of college. However, as Assistant Principal Investigator Archer (Assistant PI Archer) remembers, NASA also wanted to offer experiences to high school freshman and sophomores but was unsure what these experiences should be or how they should be implemented. Finally, NASA wanted to level the technology playing field for underrepresented populations and lower economic standing.

PI Marsh describes how OSU's NASA Education Projects approached the INSPIRE concept and prepared a proposal stating that, "we use our expertise about what we know about education, what we know about NASA and our abilities here to deliver back to NASA". He further explains that the biggest hurdle in the initial stages of the proposal was developing the online technologies necessary to make the project a reality. OSU had the Desire2Learn Learning Management System, which gave the group a place to begin. OSU submitted the proposal and was selected in March 2008 to receive the funding for this contract.

Upon receiving the cooperative agreement in March of 2008, the OSU staff was asked to put together the first Summer STEM Experiences (SSE) to take place during the summer of 2008 giving the team, who at the time consisted of two administrative assistants, and the principal investigator and assistant principal investigator, mere months to put together the first part of this project. Shortly before the summer sessions began, the three education specialists were hired and put to work immediately trying to coordinate the SSEs with each of the ten Centers on such short notice. Toward the end of the summer, the OLC Administrator and the IT Specialist were hired on to begin initial

works with the OLC. The OLC was developed and beta tested between October 2008 and

January 2009 and went live to the community members at the end of January 2009, just

in time for the students to apply for the 2009 SSEs. These positions and the application

process will be described in more detail later.

INSPIRE Purpose.

According to those who work on the project, INSPIRE has a vast purpose within

NASA education. This project gives students an opportunity to engage with NASA

content and each other to enhance learning and STEM learning outcomes as well as

promoting NASA itself: what it is, what it does, and what it plans to do. Additionally, this

project gives students the opportunities to become aware of careers and career

opportunities within NASA. As a part of the NASA pipeline, INSPIRE strives to engage

and maintain student interest in STEM content, degrees and careers. INSPIRE bridges the

gap between interest in middle school, when students begin making career choices, and

college by providing them with STEM and NASA specific information in order for the

students to figure out what they do or do not like in STEM. INSPIRE can help guide

them through this process so they have the skills, desire, and knowledge necessary to

enter into college and pursue a degree/career of interest to them. By keeping students

interested in NASA throughout their educational career and as students are earning

degrees and searching for jobs, NASA can take these same students that they were

engaging in middle school and employee them after college. As a part of INSPIRE,

students have the opportunity to engage with like-minded individuals who have the same

interests, expectations and goals as they themselves do. Students also have the

opportunity to interact with NASA personnel and experts to give them the real world,

behind the scenes information that highly motivated students need and want to have in order to make life long decisions about careers.

The INSPIRE project helps OLC members to discover new ideas, connect with other people and equip themselves to pursue other opportunities to build skills and knowledge. INSPIRE also gives parents/caregivers/family the opportunity to engage in STEM related content and involve them in the interaction experiences that the students have as a part of INSPIRE by giving them access to the same materials and content that the students have access to and by providing them with additional parent/caregiver specific content and opportunities.

The INSPIRE Project: OLC and SSE

INSPIRE Online Learning Community.

The OLC provides a place for students to engage in STEM content and to interact with other students through group projects, chats, blogs, etc. The INSPIRE project is highly competitive asking students across the nation to apply and wait for acceptance in order to participate. The students participate as a community of learners through a learning management system called Desire2Learn.

Summer STEM Experiences.

While the Online Learning Community is the cornerstone of the INSPIRE project, there is a unique opportunity for OLC members to apply for Summer STEM Experiences. These experiences are different for every grade level. As Ron Archer explains,

> We have a different experience for every grade level. Basically, the idea is that
> the younger grades have a broader experience, a more high level type of

information and getting familiar with the science, technology, engineering and mathematics that NASA does and then as they progress thru their grades then we bring them in to more narrow, where they can have a better idea if they want to focus in on a particular area of content or area of career, that way they can gain more knowledge.

Each of these experiences are described on the website as:

Explorer Experience: INSPIRE OLC participants in the ninth grade may compete for The Explorer Summer Experience. Selected applicants and their parents/guardians receive a trip to the NASA facility within their service areas, where they will participate in a VIP tour and workshop. The visit occurs the summer between the students' ninth- and 10th-grade school year.

Collegiate Experience: INSPIRE OLC participants in the 10th grade may compete for The Collegiate Summer Experience. Students selected participate in a two-week on-campus experience at a Space Grant Institution/University. Students are chaperoned by the host institution where their exposure to college life is designed to improve study skills and encourage the pursuit of higher education and careers in STEM areas. NASA INSPIRE pays round-trip travel expenses for those students who live more than 100 miles from the college or university providing this experience. In addition, the college or university provides lodging, meals, supervision and educational activities. The Collegiate Experience occurs the summer between the students' 10th- and 11th-grade school year.

Residential Internship: INSPIRE OLC participants in the 11th grade may

compete for the Residential Internship Summer Experience. Selected students participate in a paid, eight-week internship under a NASA mentor at the NASA facility within the students' service areas. During the internship, students are provided:

- A stipend based on minimum wage for the state in which the NASA facility is located and a lunch allowance.
- Meals and housing at a location within commuting distance from the NASA facility, typically a nearby college dormitory.
- Daily transportation to and from work and required project activities.
- Supervision and mentoring by scientists and engineers at the NASA center during working hours.
- Interaction with qualified, experienced and highly motivated professional educators who provide supervision and implement the enrichment activities and cultural activities during non work hours.

Pre-College Internship: INSPIRE OLC participants in the 12th grade who have been accepted to attend a college or university to pursue a STEM degree may compete for the Pre-College Internship Summer Experience. Selected applicants participate in a paid, eight-week internship with a NASA mentor at the NASA facility within their service areas. During this internship, the student receives a stipend and is then responsible for making all lodging, meals and transportation arrangements.

To be considered for a summer STEM experience, INSPIRE Online Learning Community participants must at a minimum:

- Be an active participant in the INSPIRE Online Learning Community.

- Have a 3.0 academic grade point average on an unweighted 4.0 scale.

- Submit updated transcripts, recommendations and parental consent forms, and other documentation as instructed.

- Students must be at least 16 years of age to participate in the Residential Internship or the Pre College Internship.

Summer OLC.

Even during the summer, when the Summer STEM Experiences are in full swing and much of the project team's attention is focused on the NASA Centers, the OLC is still available for those who either did not receive an offer for the summer experience or who choose not to apply. The OLC is operational year-round, but because the project has a small staff, the OLC has to adapt during the summer time. As a result, the summer OLC looks slightly different than the school year OLC when the OLC is the most intense in terms of content. While layout remains the same, activities and content will be different. There is a strong desire within the team to connect the SSE to the OLC students. This is achieved by providing for as much interaction between the two groups as is possible giving the OLC students a chance to be a part of the experience even though they are not physically attending one of the SSEs. During the summer, the INSPIRE blogs are written by the students at the Residential Internships, and this gives the students, and parents, at home a chance to see what is going on at the Centers and to ask questions and leave comments. In addition to the connection with the SSE during the summer, OLC members have different opportunities available to them. While weekly activities are not produced during the summer months, there are different opportunities available to members who

are interested in continuing active participation. Group projects have been a major staple of the content for the summer OLC. For the past two years, OLC students have had the opportunity to sign up during the month of May to participate in two month long nationwide group projects ranging from the design of a new international space station to the creation of a leg of the Amazing Race: INSPIRE Edition. Long-term group projects are traditionally called Challenges within the OLC and are an opportunity for students to network with peers across the nation and give them an opportunity to focus on a particular area of interest. Long-term group challenges are chosen during the summer months in order to give students flexibility in their participation, making accommodations for those who go on family vacations or have other internship opportunities. Students that are participating in the INSPIRE SSEs have the opportunity to participate and are encouraged to create groups of their peers that are experiencing the SSE with them.

Individuals

As the project is a joint effort between NASA education and OSU's College of Education (COE), NASA employs certain individuals while others are employed by Oklahoma State University through the COE's cooperative agreement. Each employee, whether working directly for NASA or OSU have different duties but are working towards the same overarching goal: to make the project successful. Figure 2 is an

organization chart of the Oklahoma State University side of the INSPIRE Project.
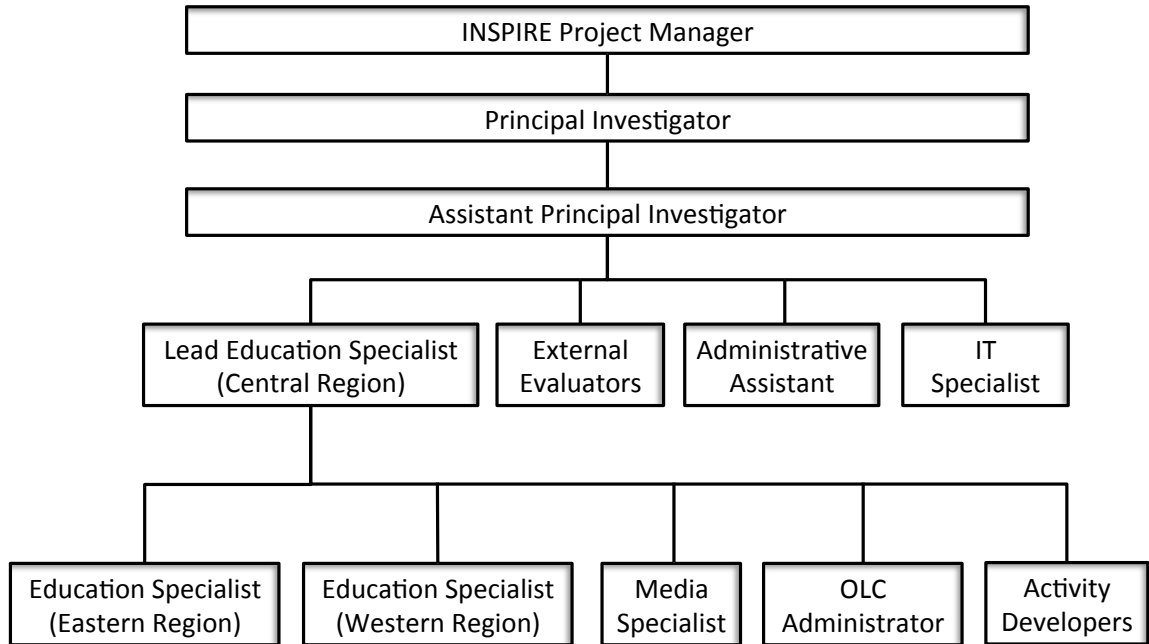
NASA INSPIRE Organization Chart

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┌─────────────────────────────────────────────────────────┐
│                  INSPIRE Project Manager                 │
└─────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────┐
│                  Principal Investigator                  │
└─────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────┐
│              Assistant Principal Investigator            │
└─────────────────────────────────────────────────────────┘

┌──────────────────┐  ┌──────────┐  ┌──────────────┐  ┌──────────┐
│ Lead Education   │  │ External │  │ Administrative│  │    IT    │
│ Specialist       │  │ Evaluators│ │  Assistant   │  │ Specialist│
│ (Central Region) │  │          │  │              │  │          │
└──────────────────┘  └──────────┘  └──────────────┘  └──────────┘

┌──────────────────┐ ┌──────────────────┐ ┌──────────┐ ┌──────────────┐ ┌──────────┐
│ Education        │ │ Education        │ │  Media   │ │     OLC      │ │ Activity │
│ Specialist       │ │ Specialist       │ │ Specialist│ │ Administrator│ │Developers│
│ (Eastern Region) │ │ (Western Region) │ │          │ │              │ │          │
└──────────────────┘ └──────────────────┘ └──────────┘ └──────────────┘ └──────────┘
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Figure 2. INSPIRE Oklahoma State University - Organization Chart.

NASA Employees.

Project Manager.

The Project Manager is the official project lead. This individual reports to the

main NASA Education office about the progress and success of the INSPIRE project. He

also works directly with NASA and OSU to create INSPIRE's annual budget and to make

final project decisions. The OSU team meets regularly with this individual to discuss

goals, suggestions, and opportunities to make INSPIRE a better project. While the

Principal and Assistant Investigator have final decision making authority within the OSU

area of the project, the INSPIRE Project Manager has final decision making authority for

the project overall. The Project Manager also works directly with the Project Specialists and coordinates the interactions between those individuals and the project team at OSU.

Project Specialists.

The INSPIRE Project Specialists are a group of NASA employees who work with the INSPIRE project at each of NASA's ten Centers. Each Center appoints an INSPIRE project specialist to work as the liaison between the Center and OSU. There is at least one project specialist for each of the ten centers, while some of the larger centers have two individuals working together. These individuals work extensively with the INSPIRE Summer STEM Experiences (SSE) by coordinating the selection of the SSE recipients and arranging mentors, tours, and opportunities as well as managing the INSPIRE students while at their Center. The project specialists also work with the INSPIRE OLC by contributing valuable Center-related content, by informing OSU of NASA opportunities and events, and by assisting the OSU team in finding speakers and presenters for chats. While responsibilities with the INSPIRE project can be extensive, many of the Project Specialists find themselves working on a variety of different projects for NASA education and may have their time split amongst the different projects to which they are assigned.

OSU Employees.

Principal Investigator.

Principal Investigator Marsh (PI Marsh) is a member of the Oklahoma State University's (OSU's) NASA Education Projects team and works as the Principal Investigator for the INSPIRE project. As a member of the OSU team who wrote the original project proposal that was submitted to, and accepted by NASA, this individual

has intimate knowledge of the project from its initial development stages. According to PI Marsh, the role of the Principal Investigator is to coordinate all aspects of the project from the financial budget issues to the logistics, to interactions with NASA to facilitation of the implementation of the project. The Principal Investigator is a vital part of the INSPIRE project and is present at most meetings and has final decision making authority within OSU's project area. The Principal Investigator is also a direct link between the OSU INSPIRE team and the NASA INSPIRE team providing support to the OSU team while maintaining relations with the NASA side of the project. The Principal Investigator is a higher education professor with many years of experience teaching aviation education in the formal setting.

Assistant Principal Investigator.

Assistant Principal Investigator Archer (Assistant PI Archer) is also a member of OSU's NASA Education Projects team working with all four of OSU's NASA contracts. Assistant PI Archer was also a member of the team who wrote the initial proposal and is present at most meetings. The Assistant Principal Investigator helps to manage the overall project's goals and outcomes by making sure that the project has the staff available to implement the project, that the staff has the resources they need whether that includes money, materials, etc. Assistant PI Archer also has final decision-making authority within OSU's project area and works directly with NASA's Project Manager and the Centers' Project Specialists to ensure that everything runs smoothly as well as working with the evaluators to ensure that the project's goals and outcomes are fulfilled. According to Assistant PI Archer, he does not have a formal background in the field of

education but has picked some things up over the years of being around and working with educators.

Education Specialists.

There are three Education Specialists working with the INSPIRE project. These individuals are responsible for monitoring and working with a specific region with the US: eastern, central, and western. Each education specialist has had previous experience working with the OSU NASA Education Projects, many of which were informal in nature, and have each had formal teaching experience in the K-12 classroom. Along with other responsibilities, these individuals work specifically with the development and maintenance of the content within the OLC as well as the overall functionality of the program. These three individuals maintain most of the day-to-day functioning of the project and are the main connection between each of the NASA Centers' Project Specialists within their area.

Currently, each of the education specialists works with the OLC by participating in the weekly live chats and monitoring discussion board postings. In addition, the project specialists ensure that the quality of everything that is posted to the OLC remains high. Beyond the OLC, the education specialists organize the summer STEM experiences by developing the schedules; providing guidance; appearing in person to run various aspects of the experiences; recruiting, interviewing and preparing chaperones and student advisors who work with the internship students; and traveling to conferences, meetings, and various other requirements as they arise.

When the education specialists were first brought on as a part of the project, their roles were not clearly defined. As the project has developed, their roles have evolved and changed to meet the needs of the project and the project team. Initially, the education specialists thought they would be providing education content and activities and focusing more on pinpointing student interests and what would keep them interested. However, their roles are, in some ways, vastly different from that initial concept. As the project progressed, the three education specialists diverged and, while working toward the same goals and working together in many aspects of their job, each individual has a different area of focus.

Each of these individuals, in addition to working closely with the project specialists and the summer STEM experiences, also has other areas in which they focus. The eastern region education specialist Graves (Ed. Specialist Graves), is the main contact for the INSPIRE OLC. His responsibilities include content development; setting up and running weekly blog postings and NASA scientists/experts chats; monitoring the discussion board; and various other aspects of the development and maintenance of the OLC. In addition to working with the development of the online learning community the central region specialist, Education Specialist Ives (Ed. Specialist Ives) is the INSPIRE Lead Education Specialist. Ed. Specialist Ives provides administrative support through the writing of weekly reports, the development of INSPIRE documents including administrative documents, oversees the maintenance and day-to-day operations of the project, and assists in gathering data for the outside evaluators. The western region education specialist, Ed. Specialist Wallace, deals with the recruitment of students and interested parents and teachers.

Lead Education Specialist.

Ed. Specialist Ives, the lead education specialist, works with the central area of the United States and has become an overseer of the OLC. Ed. Specialist Ives states that in order to ensure that the OLC, and the project, runs smoothly, she spends her time defining roles for other project members, helping to identify areas of expertise and/or weakness and assigning tasks/roles based upon that knowledge. This includes confirming that all tasks, both weekly and long term, are identified and completed in a timely manner.

OLC Lead Education Specialist.

Ed. Specialist Graves states that he plays the role of the "teacher" in the OLC. As the moderator of the OLC, Ed. Specialist Graves oversees the chats and discussions, and is the "face" of the OLC for the members. He not only sets up speakers for the weekly chats but is the individual who introduces those speakers and moderators the question/answer session with them afterwards. Additionally, Ed. Specialist Graves frequently writes entries for the INSPIRE blog and sends out messages to the students through the eINSPIRE and News area of the home page, as well as through the INSPIRE's official Twitter feed. The result, Ed. Specialist Graves says, is that students see him as someone who is helping them through the community, showing them the way and making sure that their experiences in the community are positive ones. Most members of the OLC know Ed. Specialist Graves by name and by voice (through the weekly chats) and some can even identify him by face (due to the picture located on the team page). Ed. Specialist Graves has a very direct line to the students being the point of

contact between the Student Advisory Council and the INSPIRE project team giving him a unique perspective to the needs and desires of the community members.

Recruitment Education Specialist.

Ed. Specialist Wallace works on several areas for the INSPIRE project. For one, she manages the *Equip Page* providing students with information to help prepare them for their future. Additionally, within the OLC, Ed. Specialist Wallace works as a quality control ensuring that all links are working properly and that content is clear and relevant as well as making sure that all information is current and assisting in the removal of outdated information. Beyond her roles within the OLC, Ed. Specialist Wallace works to recruit students on a national level traveling frequently to various teacher conferences and opportunities to spread the word about the project to educators who can then pass that information along to their students. According to Ed. Specialist Wallace, recruiting students for INSPIRE goes beyond teacher conferences, requiring her to be in constant communication with the education departments in each state as well as many other advertising entities within the educational community.

OLC Staff.

The role of the OLC staff is to keep the day-to-day function in the online community done as well as try to keep it exciting, new and fun. There are four main individuals who work directly with the OLC on a daily basis; the OLC Lead Education Specialist, the OLC Administrator, the Media Specialist and the Activity Developer.

OLC Administrator.

OLC Administrator Gardner has been working with the INSPIRE project since the first year, being brought on initially to develop content activities. This role, like many of the others, has evolved and developed over the course of the past three years. OLC Administrator Gardner worked to develop the initial version of the Online Learning Community and worked extensively to alter the look/feel prior to the start of the second year of the OLC. Administrator Gardner now works on the maintenance of the community by posting updates, making changes and ensuring that the environment of the community runs smoothly including: developing content for the OLC, designing and developing the online community environment, assisting in the development of project rules/regulations and working with NASA Education Project employees across the nation in the development and progress of the community.

Initially, the OLC Administrator prepared and posted the activities each week in addition to coordinating the surveys. Now, OLC Administrator Gardner is working on developing the new *Showcase Page* as well as preparing and implementing the 2011 summer OLC challenges. In addition, this individual is planning and preparing a new type of activity to be featured this summer called Modules.

Media Specialist.

Media Specialist Stevens, was brought on halfway through year two of the project. She initially helped with the development of the summer challenges and assisted in the development of the *Showcase Page* and other media aspects of the community. This position has evolved and Media Specialist Stevens is currently preparing and posting the weekly activities to the OLC as well as coordinating all of the evaluations within the surveys tool.

Activity Developer.

Activities are a large part of the INSPIRE content. New activities are added weekly to the OLC that students can complete to learn more about a particular topic or subject area. All activities are developed using NASA approved education materials and with a focus on NASA but can range from aeronautics and moon/mars topic areas to solar system and universe topics. All activities are developed by the INSPIRE Activity Developers and are specifically designed for the OLC. Some activities are created from scratch, and others are adapted from formal, face-to-face classroom materials previously produced by NASA. The activity developers have changed yearly and include individuals who work in other areas of higher education, individuals who work within other areas of the INSPIRE Project and individuals who are contracted to just create the activities themselves. There is only one activity developer working with the project at a time, and there have been four different activity developers since the project's beginning. Each individual has had a different background within education. The first activity developer, OLC Administrator Gardner, worked in conjunction with Dr. Aberthy, a faculty member in the College of Education, to develop the activities through the first year and the first half of year two of the project. OLC Administrator Gardner had been teaching undergraduate students for approximately two years, at this time, but in a field unrelated to education. Dr. Aberthy, was an Assistant Professor in educational technology who, according to Dr. Aberthy himself, had no experience teaching K-12 science or mathematics. Eventually, Dr. Aberthy took over the activity development as OLC Administrator Gardner's role within INSPIRE evolved. During the second half of year two, Dr. Aberthy was replaced by Activity Developer Carver who came to the project

with a few years experience teaching high school science and mathematics. Activity

Developer Carver was able to use her experiences in the classroom to further develop the

OLC activities through the remainder of year two but was eventually offered a job with a

different NASA Education Project, which she accepted. Year three brought a new activity

developer, Activity Developer Grass. Activity Developer Grass' experiences in K-12

education and teaching at the community college level provided a basis for the

development of the INSPIRE activities.

Additional Staff.

Additional NASA Education Projects staff members work off and on over the

OLC year to assist with various tasks and projects. Administrative Assistants work

tirelessly to coordinate travel, purchase necessary equipment, set up interviews, put

together and maintain budgets, answer help desk phone calls and e-mails as well as many

other tasks to ensure that the projects run smoothly. The Information Technology

Specialist assists with back-end database analysis and maintenance. Additionally, student

workers and other graduate assistants work to assist in the verification of applications and

processing incoming paperwork. These student workers and graduate assistants are

employed by OSU's NASA Education Projects and do not work on one specific project

but work on each project on an as needed basis.

External Evaluators.

The external evaluators for the NASA INSPIRE Project are contracted to conduct

evaluation of the project, including its current status in meeting its goals, and make

suggestions for moving forward. There are two individuals working as evaluators, a

primary and secondary. Evaluator Donaldson has many years of experience conducting

external evaluation. Due to her involvement as an evaluator on many other NASA Education Projects, she has stepped away from the main role with the INSPIRE project and serves as a secondary to Evaluator Davidson, providing support and advice as needed. As the primary evaluator, Evaluator Davidson is the main contact point for the evaluation of the INSPIRE Project. His responsibilities include creating surveys, gathering data and writing reports for both OSU and NASA.

The evaluators are contracted to provide unbiased, outside evaluation of the progress of the INSPIRE project for OSU and NASA project team members. These individuals have been evaluating the project since the beginning. The outside evaluators create surveys for the OLC members, the project specialists, the SSE recipients, the OSU INSPIRE project team and the SSE mentors. These surveys, along with other data gathered (such as login information, activity usage, etc.) are compiled to give an overall view of the INSPIRE project. The evaluators then compare the results of the data to the INSPIRE's stated goals to determine if the project is on track and in what areas the project needs to focus. This data also helps the OSU team to make decisions about content and can give insight into areas previously unknown to the tem. The evaluators also work in conjunction with the INSPIRE Project Manager to develop the INSPIRE annual report that is sent to the NASA Education office for review.

Evaluation.

A great deal of evaluation is conducted over the OLC year in order for the evaluators to make conclusions as to the current state of the project. Each year, prior to being given access to the Online Learning Community, accepted members, both parents and students, are required to complete a Pre-OLC Experience Questionnaire using the

survey tool in Desire2Learn. This is followed up in May with an End of OLC Experience Questionnaire. Even though the community is open year round, post survey data is collected in May as the focus of the project switches to the SSEs and the students' focus shifts to the summer holiday. Additionally, evaluation data, in the form of surveys, is collected prior to the start of each Summer STEM Experience and immediately following the SSE. This evaluation data is collected in order to get a clearer understanding of members' expectations (pre-survey) and member experiences (post-survey).

Community Members.

OLC Members include those individuals who actually participate as members of the online learning community that has been developed. A part of the OLC members are the students who apply, and are accepted, to the OLC consisting of 9-12th grade students from across the nation. These students are interested in science, technology, engineering, and mathematics are a driven towards increasing their knowledge and connections within these areas and many will eventually pursue college degrees and careers in these areas.

The other part of the OLC Members group includes the parents/caregivers of the accepted students. When a student is accepted into the INSPIRE OLC, they are given a personal login to be able to access the information and opportunities within the OLC and their parents are given a personal login access as well. The parents even have parent specific discussion areas and opportunities, such as parent specific chats, that are available to them to give the parents the knowledge and opportunities to help their students achieve their STEM/NASA education and career goals.

Student Advisory Council.

The Student Advisory Council (SAC) was developed during the second year of the project. Assistant Principal Investigator, Ron Archer, describes what led to the creation of this group stating,

> we were not feeling that we were being as successful as we could be and looking at some of the first survey data that was coming in wasn't as high as we would like it to be.

This caused the team to reflect on how to best meet the needs of the OLC members. Since many of the individuals working on the project have backgrounds in traditional educational settings, it occurred to them that, just like in traditional schools, a student council of some sort would help the team better understand the expectations and needs of the members of the community. The INSPIRE OLC Student Advisory Council was formed. The project team examined level of activity for the community members and identified students from across the grade levels who were active and offered them the opportunity to participate in the advisory council. The OLC Student Advisory Council has been in effect for the past two years of the project and has lead to many of the advancements and changes that are present in the current OLC including changes in the look and feel of the community as well as the types of challenges presented to the community members. According to Ed. Specialist Graves, many times the students that are members of this advisory council have been out there in the community, talking on the discussion boards, participating in chats, and communicating with their peers. This allows them to get honest communication about what their peers want and need, which gives them the opportunity to share that with the project team; it serves as a way for the students to provide unfiltered communication and evaluation.

OLC Goals.

Initially, the goals of the OLC were limited to the parameters developed by
NASA during the original CAN proposal, which included creating a community for
students and their parents interested in NASA and STEM education and careers as well as
being a part of the NASA pipeline. A need developed, between the first and second year
of the project however, for these goals to evolve and develop to provide a stronger
framework with which the project team could move forward. The team asked Dr.
Aberthy, an Educational Technology professor at Oklahoma State University, to work
with OLC Administrator Gardner in the development of clearly identifiable goals and
objectives for the community. These individuals looked at the CAN and the original
proposal from OSU and tried to align the two documents. Based on that alignment and
the needs that NASA education expressed, both short term and long-term goals and
objectives were developed. These goals focused on the emphasis of community, rather
than just a learning environment, and how the D2L system's communication modules
could assist in the goals of the project. If those communication modules were insufficient
to meet the needs, exploration and evaluation of new options needed to be considered.
This was conducted, specifically, in regards to the technology used during the weekly
Live Chats. Initially, these Live Chats were conducted using a text-based system that
worked much like an instant messenger. It was decided, however, that this was
insufficient to meet the needs of community development and a new communication
module, called Elluminate®, was considered, evaluated, and eventually selected that
allowed for video, voice and whiteboard interaction both from the moderator and can
allow the students to participate in the same manners.

Goals and Objectives.

NASA INSPIRE Online Learning Community (OLC) GOAL STATEMENT:

The NASA INSPIRE OLC is committed to establishing and maintaining a NASA centered OLC in which students and parents will gain knowledge about NASA while creating a specialized network with other students, and NASA employees.

Objectives: Create and increase student interest and participation within the NASA INSPIRE Online Learning Community.

1. **Engage Community Members in Learning:**

   1.1. Develop activities focusing on NASA related content

   1.2. Develop engaging and interesting **content relevant to the students and their future careers

   1.3. Develop **content pertinent to current events in the INSPIRE Project, NASA, and the World.

2. **Make, Promote and Provide for a Professional Community of Students:**

   2.1. Make, Promote and Provide for Interaction with Students in the same grade level

   2.2. Make, Promote and Provide for Interaction with Students in different grade levels,

   2.3. Make, Promote and Provide for Interaction with INSPIRE Project Team

   2.4. Make, Promote and Provide for Interaction with NASA Experts

   2.5. Encourage and Provide Good Communication

      2.5.1. Between the INSPIRE Project Team and Community Members

2.5.2. Between NASA Experts and Community Members

2.6. Actively promote, develop and scaffold student leadership and responsibility for shaping, and evolving the online community

3. **Develop and Grow interest in NASA fields/jobs**

3.1. Promote STEM careers and opportunities.

3.2. Highlight a variety of jobs/careers available with NASA

3.3. Highlight Current NASA projects and the careers/scientists working with them

3.4. Highlight opportunities to become involved with NASA at all levels (including the INSPIRE Summer STEM Experience)

4. **Provide for Parent/Care Giver Interaction within the INSPIRE OLC**

4.1. Develop a parent community through communication with other parents and the NASA INSPIRE team.

4.2. Provide activities for Parents/Care Giver to participate with their students

4.3. Provide and promote Parent/Care Giver access to Student Content allowing for family education and support in STEM and students' careers.

*The NASA INSPIRE Project Team strives daily to achieve each of these goals and are constantly reevaluating and updating the Goals and Objectives to better meet the needs of the community.

** Content includes anything new to the OLC including, but not limited to, new activities, blog entries, INSPIRE news, NASA newsfeed, Chat opportunities, surveys, discussion board topics, etc. All content works towards promoting an ACTIVE online learning community.

The goals of the INSPIRE OLC have evolved and allowed for a firmer structure and a more solid foundation of the INSPIRE OLC and the INSPIRE project overall.

Application Process.

Students interested in participating in the INSPIRE OLC are required to apply and be accepted in order to participate in the INSPIRE Online Learning Community. Applications are accepted starting in March of the preceding year through the end of June. The OLC year starts in September and runs through the next August, mimicking the traditional school year and summer. Students who are currently members of the INSPIRE OLC must reapply and be accepted each year to continue membership. Application consists of submitting a current and most recent official transcript as well as completing the online application form and the submission of the application certification with a parent or guardian signature indicating permission to participate in the community. Once the student applies for the OLC, their application goes through a verification process in which staff and student workers of the NASA Education Projects office at Oklahoma State University work to check the information provided in the application with the official transcript submitted through mail. During the verification process, the applications and transcripts are de-identified and, once an application has been verified, the application is turned over to the project specialist associated with the center to which the student is assigned. Even though the OLC serves all students/Centers, students are accepted through the Center in their area. Once the project specialist has all of the applications for their center, the applications are reviewed and student members are selected to be a part of the INSPIRE OLC. The number of students selected each year and from each center area varies, depending upon available funding. The distribution for each

grade level, however, remains fairly even across all Centers, resulting in an even distribution of grade level in the final OLC community members. Once students are selected, they receive an e-mail welcoming them to the community and giving them a username and password used to access the community. The student's parent or caregiver, who is identified by the student during the application process, is also sent an e-mail with their own, individual, parent login username and password.

Registration Process.

Upon receiving the username and password, students, and parents, are asked to login and complete a few prerequisite items before they can begin their OLC experience. Community members watch an introductory video that orients them to the Desire2Learn (D2L) environment. Another tutorial video is then presented in which community members learn the ropes of the OLC specifically and answers to some of the most frequently asked questions are addressed. After watching the videos, the students read through the OLC rules and regulations, which remind the members to be respectful of the other community members and their privacy. OLC members take a rules/regulations quiz and then complete a Pre-OLC Experience survey to help better gauge expectations prior to the experience and provide a basis for comparison at the end of the year. As students are completing the survey, a NASA Education Projects team member monitors students who have completed the registration process and, upon completion, registers the students in the actual Online Learning Community, a process that can take approximately 24 business hours to complete. Once registered, the community members have full access to the INSPIRE OLC and all of the content therein.

Participation in the OLC is completely voluntary. Students, and parents, have the choice to complete activities, participate in chats, read/respond to blogs, communicate in the discussion board, read the news and information, search for opportunities, or not participate at all.

INSPIRE Online Learning Community Website

Desire2Learn Learning Management System Software.

According to their website, Desire2Learn (D2L) is a Canadian based company that offers many different learning platforms for K-12, Higher Education, Corporate, Healthcare and Government to provide online learning for students across several countries. The Desire2Learn Learning Environment is one of the eLearning platforms available for higher education clients and is the current learning management system being used by Oklahoma State University.

According to their website, the D2L Learning Environment enables clients to deliver content, collaborate, and design an eLearning environment through a comprehensive and flexible learning management system. A combination of teaching and learning tools, built-in accessibility adherence, measurement and assessment options, and standards-based technology, the D2L Learning Environment is flexible enough for users to make the learning management system work for them through the user-centric design.

Oklahoma State University's Information Technology department hosts both their own version of D2L as well as the NASA Education Projects version of D2L. Initially, INSPIRE worked off of one of the courses that was set up by Oklahoma State in OSU's D2L environment. Over the course of the first year of the OLC, it became quickly

apparent that this was not an ideal situation. All technical support was handled by Oklahoma State University's IT department, who would then contact D2L. This caused slow response time to questions or issues. Additionally, all enrolling of students into the course (the INSPIRE community) had to be performed by OSU's IT support personnel, causing difficulty when a password needed to be reset or if there was a problem with an account. Additionally, the layout of the community was restricted to the OSU generic theme, causing confusion for students who did not understand why they were at an OSU site when they were a part of a NASA program. After the first year, NASA Education Projects purchased their own installation of the software platform, allowing INSPIRE to develop the environment as necessary including many aspects of customization. INSPIRE also now has direct access to user enrollment and account information as well as a direct line to the D2L support staff.

The D2L environment has many learning management system features which are used in the INSPIRE OLC: calendar, blog, discussion board, quizzes, surveys, dropbox, gradebook and a third party plugin for Elluminate® software. The calendar is used to display information about upcoming weekly chats, special events, and INSPIRE deadlines. The blog feature is used periodically during the Summer OLC as a way for SSE participants to blog about their experiences and gives the students at home a method for reading them. The discussion board is used regularly for communication between the INSPIRE students. Quizzes are used extensively as an assessment tool during activity completion. Surveys are used on a frequent basis as a method for evaluation. A dropbox is a place where students can upload a file to the community. This means that as they complete activities and are submitting a presentation, a picture, a video or some other

file, they can upload it to the appropriate dropbox so that the moderator of the community has quick and easy access to it. The instructor or moderators of the course are the only individuals with access to the files uploaded to the dropbox. The gradebook is used as a place for keeping track of the points a student earns over the course of their OLC participation. Finally, Elluminate® is an interactive chat tool that allows both moderators and participants the ability to communicate, in real time, via text, audio, video or visual presentations.

Main Screen.
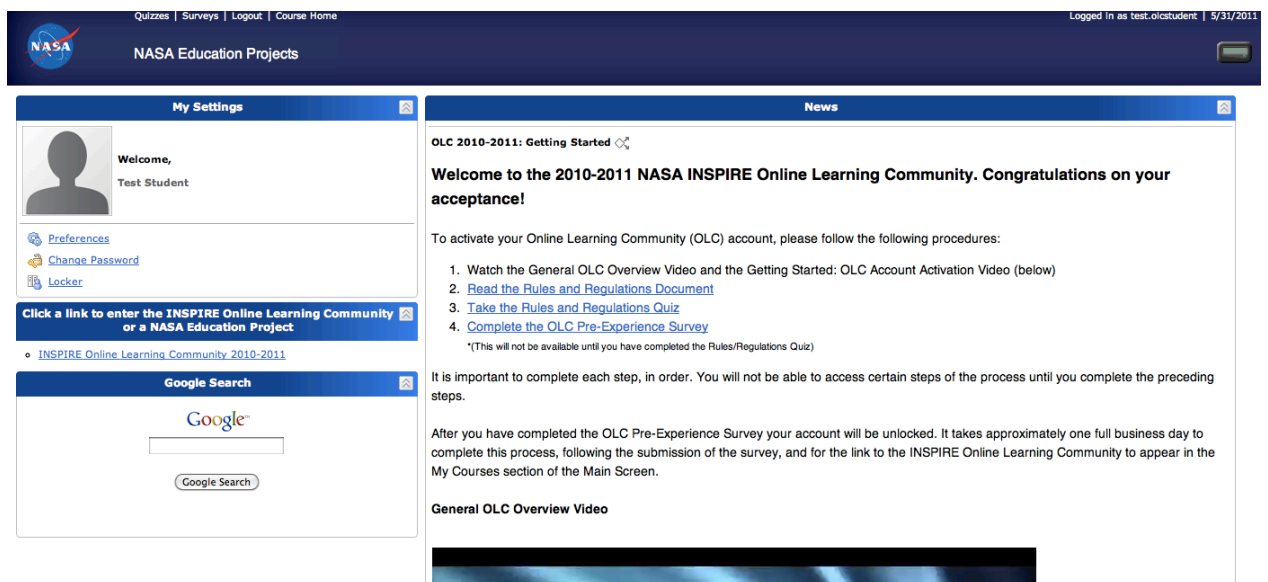
Figure 3. INSPIRE OLC Main Screen. This is the first screen the OLC member sees after login.

When first visiting the INSPIRE OLC website, http://nasaoc.okstate.edu, community members must first sign in with their assigned username and password. After logging in, members are taken to a Main Screen, shown in Figure 3, which allows them to access their account information. Community members can change their preferences, password, or homepage information from this main screen or even logout. Following completion of the registration process, in the My Courses area members will see the

INSPIRE Online Learning Community 2010-2011 link allowing them access to the

INSPIRE OLC. By clicking on this link, community members will be directed the OLC

Home Page.

Banner and Navigation Bar.
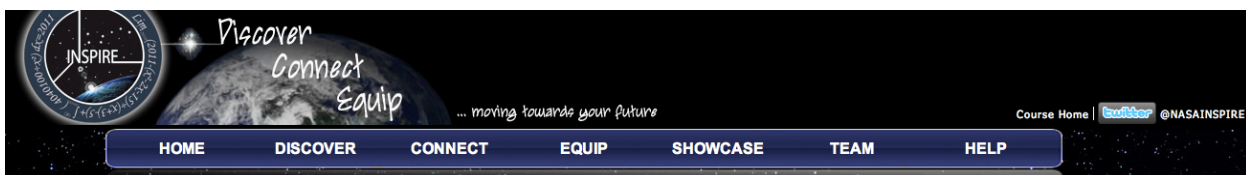
Figure 4. INSPIRE OLC Banner and Navigation bar.

At the top of every page in the INSPIRE OLC is a banner and the navigation bar

shown in Figure 4. The banner is located at the very top of the page and includes the

current OLC year's team patch, shown in Figure 5. Each year the OLC students are

encouraged to design a new team patch, or logo, and then submit their design for

consideration. The OLC team sifts through the

submissions, ensuring that all meet the design

requirements, some of which includes having the

OLC year on the team patch as well as the name

INSPIRE. Once the patch designs make it past the

initial approval phase, the OLC community

members then have an opportunity to vote on the

patches in a tournament style voting. Starting with

Figure 5. 2010-2011 INSPIRE OLC team patch winner.

approximately 64 team patch submissions, the students go through six rounds of voting

with a final victor remaining at the end. The winner of the voting tournament becomes

the team patch that will symbolize the OLC for the coming year. The banner at the top of

the OLC is one of the places in which the team patch is used but it can also be seen on a variety of INSPIRE communications, posters, stickers, patches, certificates and e-mails.

The banner is also home to the OLC motto: *Discover, Connect, and Equip*. These three key words not only provide focus for the community members, demonstrating the key elements of the OLC, but also provides navigation points and titles for other pages within the OLC. In addition to these words the banner also includes a link back to the Home Page as well as a link to the Main Screen and the NASA INSPIRE Twitter feed.

The navigation bar is an area that allows community members quick and easy access to each of the OLC's subpages without needing to return to the main page. The links provided in the navigation include: Home, Discover, Connect, Equip, Showcase, Team, and Help. The content of each of these sections are discussed below.

Home Page.

Figure 6. INSPIRE OLC Home page. This is the top portion of the OLC Home page.

According to Evaluator Davidson, the *Home Page* of the OLC is welcoming for the students. The banner is apparent at the top of the screen and the *Home Page*, as shown in Figure 6, includes a vast amount of information that community members want to have quick and easy access to. The OLC Goal is displayed at the top of the page to provide focus and reads, "The NASA INSPIRE OLC is committed to establishing and maintaining a NASA centered OLC in which students and parents will gain knowledge about NASA while creating a specialized network with other students and NASA employees." The page is divided into three columns.

The far left column includes the SSE Information (during SSE application times), the Poll of the Week, NASA Breaking News RSS Feed, Hot Links, and the archives list. The SSE Information is only visible during SSE application times, typically between December and February of the OLC year. This section provides a link to a separate page with information about application requirements, experience dates and information, as well as frequently asked questions.
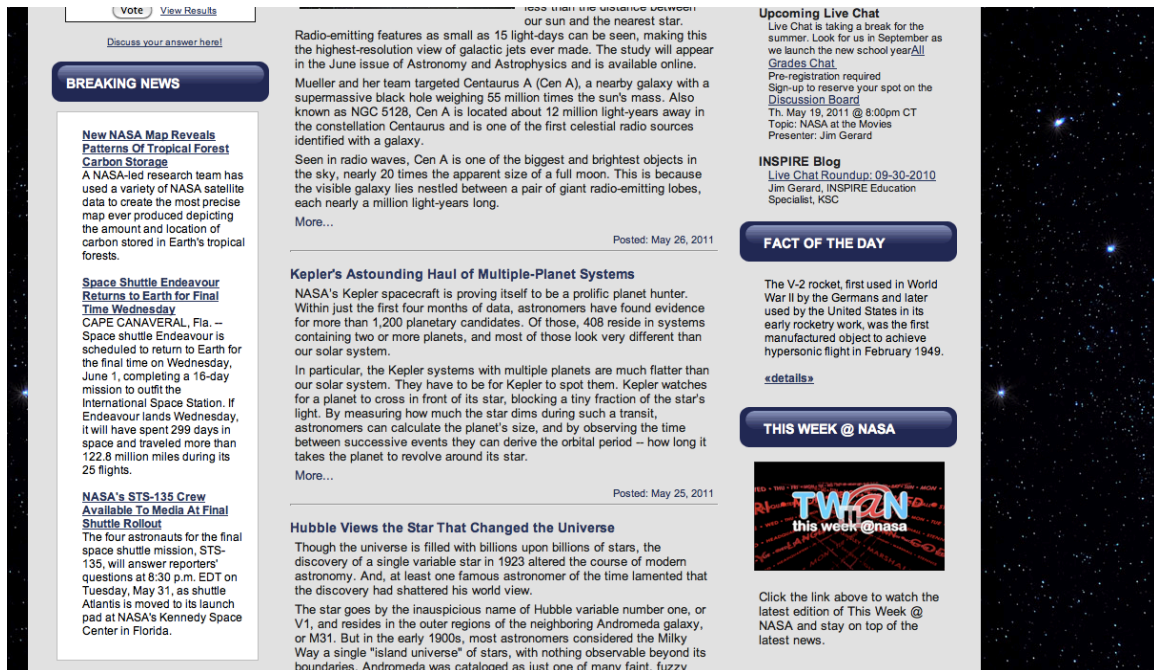
Figure 7. INSPIRE OLC Home page. This is an image of the middle area of the Home page.

The NASA Breaking News RSS Feed is an RSS feed maintained by NASA with the latest breaking news about the NASA world. This typically includes upcoming events, the latest press releases and information about upcoming launches or presidential announcements. See Figure 7. The Hot Links area provides links to the main NASA website, NASA for Students, NASA Jobs, the INSPIRE application site, and other links that have become interesting or the project team decides are valuable to students as the year has progressed as seen in Figure 8. During the 2010-2011 OLC year the featured links included the Robotic Online Virtual Exploration Rover, the Mars Science Laboratory and the NASA Missions Index.
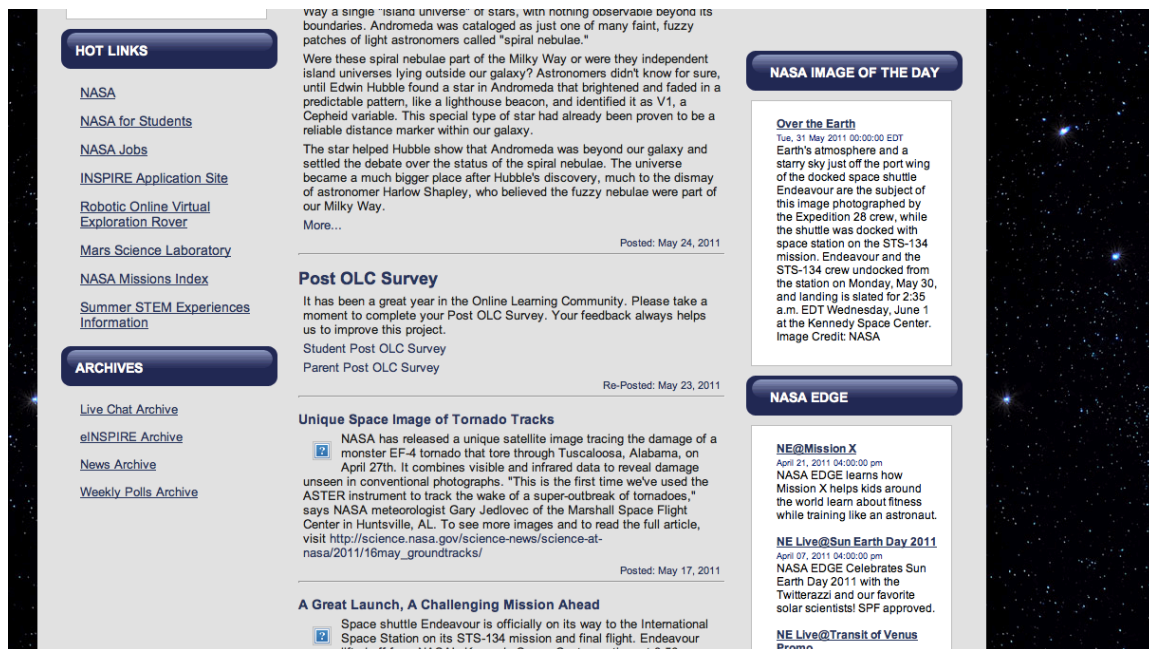
Figure 8. INSPIRE OLC Home page. This is an image of the lower part of the Home page.

Finally, the left column includes the list of available archives. The INSPIRE team archives most everything that is posted during the OLC year so that students can access information when it is convenient for them regardless of day or time. There are four archive areas that are maintained in the archives list: the Live Chat archive, the eINSPIRE archive, the INSPIRE News and Updates archive, and the weekly polls archive.

The center column includes the INSPIRE News and Updates area. In this area, community members are presented with INSPIRE news including scheduled outages for updates to the D2L system, reminders for applications to the SSE, or information about upcoming challenges. Additionally, interesting and/or relevant NASA News or NASA Science News articles are included here with links back to the original article location.

The news that is presented in this area includes a posted date so that community members are aware of the timeliness of the posts.

The final column on the far right includes the INSPIRE Theme area, the *Fact of the Day, This Week @ NASA, NASA Image of the Day* RSS Feed and the *NASA EDGE* RSS Feed. The INSPIRE Theme area is where the current theme of the week is highlighted. In this section there is an image that illustrates the current theme, as well as a list of the activities associated with the theme and information about the weekly Live Chat that revolves around the current theme including a day and time for the chat, information about the guest speaker and specific information about the topic for the chat. The *Fact of the Day* is based upon an idea from an OLC member in year one of the project. The student suggested having random facts, updated daily, with interesting information about NASA. The *Fact of the Day* section was added and provides interesting and random facts about the current weekly theme. This section is updated automatically and daily. *This Week @ NASA* is a five-to-ten minute video, put together each week by individuals at NASA, highlighting what is happening during the current week at NASA across all ten centers. A link to this weekly video segment is provided on the OLC *Home Page*. Two additional NASA maintained RSS feeds are posted on the *Home Page* as well. The *NASA Image of the Day*, with information about the newest and interesting images produced by NASA exploration, and *NASA EDGE*, unscripted vodcasts produced to educate the public about the latest information and technology from NASA.

Weekly INSPIRE Theme.

Each week features a different INSPIRE theme that focuses and directs the content posted during that theme week. The themes direct the topic of the activities, determines the topic of the weekly Live Chat, and also dictates the topic for the *Fact of the Day* during that period of time. Weekly themes can range from a variety of different topics, but, at some point during the OLC year, each Center is highlighted as a weekly theme. Additionally, current NASA missions or milestones will also be highlighted as a weekly theme.

Prior to the start of the OLC year, the OLC Lead Education Specialist Ives, works with OLC Administrator Gardner to develop a schedule for the weekly themes for the upcoming OLC year. One of the major goals for these weekly themes is that they are current, so great care and effort is placed on determining what NASA events and/or milestones are coming up over the course of the year and aligning the INSPIRE themes to reflect these events. For example, this past year there were several launches as the shuttle program comes to an end. During the weeks that the launches were scheduled to occur, weekly themes, such as History of the Space Shuttle, were chosen to reflect those launches.

eINSPIRE.

The eINSPIRE is a weekly e-mail communication that is sent out to both the student and parent community members. The *eINSPIRE* is sent out every Monday afternoon to remind community members of the weekly theme, the upcoming chat, the newest activities and other important things that are coming up as a part of the INSPIRE project including deadlines or new opportunities. This communication is meant to be a way to remind members that the community is there and waiting for them to participate

and to encourage their participation by sparking an interest in something highlighted during the eINSPIRE. According to Ed. Specialist Graves, he compiles the *eINSPIRE* and it is then reviewed by the project team prior to being emailed out.

Discover Page.

The *Discover Page*, as shown in Figure 9, is where students go to discover new knowledge, interests, and passions through STEM-related content. The focus of the *Discover Page* is to get students to explore different avenues of learning through the completion of activities and challenges. There is an area in the far left column called *Activity Highlights*. This area highlights the newest activities posted to the OLC that align with that week's theme. The title of the activity as well as the INSPIRE area, a short description, a posted date, and a link to the full activity description and instructions are provided for the three most recent activities.
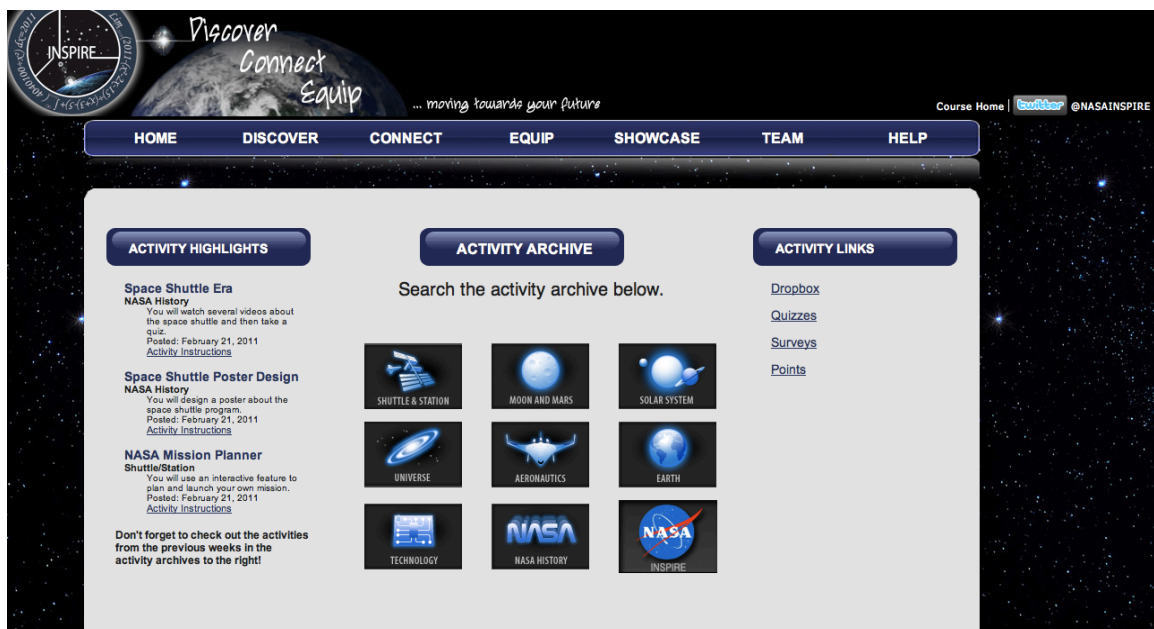
Figure 9. INSPIRE OLC Discover page. This is where students select activities to complete.

The center and far right columns are reserved for the activity archive and activity links.

Activities.

An important thing to note is the difference between the terms *activities* and *content* within the INSPIRE OLC. The OLC content includes any and all information posted to the OLC, including but not limited to, blog entries, INSPIRE news, NASA newsfeed, Chat opportunities, surveys, discussion board topics, etc. Activities are just one of the various different types of content available within the INSPIRE OLC. There are a variety of different activities that students can choose from and, upon completion, earn points for. Points are used to gauge student activity level during the Summer STEM Experience applications. Each activity is based on NASA approved education materials and/or NASA approved content found in the NASA portal (website). There is an area within the NASA Education website that allows educators to search through NASA Education materials based upon grade level, content area, and material type to find lesson plans, websites, resources, handouts, educator guides, lithographs, videos, bookmarks and classroom activities. According to Dr. Aberthy, all of NASA's education materials were developed by different people with different levels of expertise and focus and for different audiences, making it necessary to adapt the materials to INSPIRE's students both in interest, ability and grade-level appropriateness. Dr. Aberthy contends that there tends to be very little consistency in presentation of the materials, in addition to the fact that most of the education materials found on NASA's website are prepared for face-to-face classroom instruction. Working as activity developers, Dr. Aberthy and OLC

Administrator Gardner initially developed a structure for adapting these materials that was flexible, but would allow for some continuity between the different activities developed and posted in the OLC.

Dr. Aberthy states that these content activities help to structure some of the communication aspects of the OLC, and many of the communication aspects lead into the content activities. During the second and third year of the project, this connection has become more pronounced and has created a sense of interconnectedness between the different aspects of the OLC.

Figure 10. Activity Archive. This image shows the NASA INSPIRE activity archive area.

These activities are developed around a weekly theme and are organized based upon INSPIRE area. According to Activity Developer Carver, an Activity Developer, there are nine INSPIRE activity areas: Shuttle/Station, Moon/Mars, Solar System,

Universe, Aeronautics, Earth, Technology, NASA History, or NASA INSPIRE. Activities are archived in the activity archive area of the Discover page in the center column as shown in Figure 10.

In addition to the INSPIRE area, each activity is organized by activity type. These activity types include experiments, essays, quizzes, creative products, mathematics, Web 2.0 tools, presentations, and building models. Ed. Specialist Ives explains that activities are organized by type in order to prevent the same type of activity being used too frequently. This prevents three activities, based on one theme, to all include having community members write different essays over the same topics, allowing the activity and content to be fresh and different from the other activities students have seen and completed. Parent/Caregiver required activities, while not prevalent, are also included in the activity development phase in order to incorporate the parent/caregivers more actively in the OLC.

Following the determination of the weekly theme topic, the INSPIRE area, and the activity type, the activity is then created based upon an activity template that has been created and refined over the years by OLC Administrator Gardner and the various Activity Developers to reflect the components necessary for understanding and completion of the activity. Every activity begins with some form of objective as well as an introductory sentence or paragraph explaining the content and/or problem that the activity will be addressing. This is followed by detailed description and background information necessary for completing the activity. Background information can range from knowledge/skills necessary to complete a task to information needed in order to understand a concept, and it is sometimes presented as links to various NASA websites or

paragraphs of information compiled for the students. After the background information, the students are given a list of materials necessary for completing the activity followed by the procedures. The procedures are typically written in the form of steps to complete.

Activities typically needed to be converted from face-to-face formal classroom materials into an online, informal context. This manifests itself in converting demonstrations to student run experiments or finding videos of the demonstration on NASA's website. Additionally, it was necessary to change references like "ask your teacher", "talk to your teacher", to "discuss on the discussion board" or "talk with a family member about what you found." Finally, it became important to find ways for students to share their completed activities in order for them to receive credit for completion. This results in the need for either automated assessment or providing opportunities for students to post their completed activities in the D2L system. This is achieved in a few different ways. Automated assessments are used so that no one on the INSPIRE staff has to monitor the completion of the activity; it is done automatically within the D2L system. This type of completion check is restricted to having the students take an online quiz over the material. While effective and simple, this restricts the types of activities the students could do and the materials that they produce from those activities. So, in addition to quizzes, activities sometimes require students to submit files to the dropbox in order to share their completed activity with only the moderators of the community, or students are asked to participate in a discussion board with their peers either by posting their activity to the discussion board to share with other students or by replying to another students post or posting a question about a specific topic. When the dropbox or discussion board is used, the Activity Developer is responsible for monitoring

these areas and putting the points the student has earned into the system manually. The Activity Developer monitors the completion of the activities by looking through each of the activity dropboxes and discussion boards for new file uploads and new discussion postings. The Activity Developer then has up to ten business days to post the points the student has earned.

Activities are also assigned a difficulty rating and an approximate time required. The approximate time required is displayed to allow participants to gauge their desire to complete the activity and to see if they have the time necessary to complete the activity. All times are approximate, as time to complete the activity will depend greatly upon students' focus, content knowledge, capabilities, and desire to learn. The difficulty rating assigned to the activity is based on a four star system. A one-star rating indicates that the individual does not need any prior knowledge or experience with the content in order to be able to complete the activity in the approximate time required. A two-star difficulty indicates the participant will need a beginner level knowledge; a three-star indicates a moderate knowledge level and a four-star means that the participant should have advanced knowledge of the content in the activity. The rating system does not mean, however, that a beginner cannot complete an advanced activity; it merely indicates to the participant that if the time required is one hour with a four-star rating (advanced) then it will, most likely, take significantly longer than one hour for the beginner to complete the four star activity. The time required and the difficulty rating allow the member the ability to make informed decisions about the activities in which they would like to participate before devoting a great deal of time and effort.

After the Activity Developer creates the activities, the finished product must be reviewed before it is placed online. The Activity Developer sends the completed activities to the contact for the OLC, which is typically the OLC Administrator but is also handled by the Media Specialist Staff Member. Once the activity is received, it is uploaded to the project's FTP site for easy access. The OLC Lead Education Specialist, Ed. Specialist Graves, first performs a content review on the activity. This content review examines the activity to ensure that the level of difficulty and content are appropriate for the students in the OLC and that the content is of interest to community members. Following the content review, the activity is sent on to the Recruitment Education Specialist, Ed. Specialist Wallace, who performs a quality control review of the activity ensuring that there are no grammatical errors, that the links all work properly and that spelling and sentence structure make sense. Following this final review, the activity is sent on to the individual who will post the activity online. For the first two and a half years of the project, this task was assigned to the OLC Administrator but is now being handled by the Media Specialist, Donna Stevens. Once Donna receives the activity, it is converted from a word document format into HTML and CSS coding which is then uploaded to the OLC website. At this time, Donna creates all dropbox, discussion board, and quiz elements associated with the activity and also creates a link within the archives so that the activity can be accessed at a later date. This part of the process typically happens on the Monday morning of the week that the activity being prepared is assigned to be made available based upon its relationship to the weekly theme. At this time, the *Weekly Theme* area of the *Home Page* is updated as well as the *Discover Page's Activity Highlight* area. These updates take place each Monday during business hours and are

completed by 3:00pm CT. Parents are able to complete activities as well and earn points but the points earned for parents are not transferable to their student and will not appear on the leaderboard.

Challenges.

Challenges are a type of activity offered through the INSPIRE OLC. What differentiates challenges from activities is that activities are individual based and typically short term. Challenges, on the other hand, are usually group-based and will typically take place over the course of several months. While some of the challenges, such as the Summer OLC Challenges, are developed by the INSPIRE team, challenges are usually NASA sponsored competitions in which INSPIRE gives students a way to create groups and communicate with members from across the nation. By organizing groups for the NASA sponsored challenges, students who would not normally be able to participate on their own or at their own school, have a chance to be a part of the exciting opportunities that NASA has to offer through participation in the NASA INSPIRE Project.

Modules.

A new type of activity to be offered beginning summer of 2011 are Modules. Modules will allow community members to explore specific topics in depth as well as introduce new areas within science, technology, engineering and mathematics. Modules will focus on a broad area of interest with different levels within the module addressing specific areas. Each level will build upon knowledge and experiences from previous levels and will allow community members the ability to engage in a variety of different types of activities along the way. Each level will contain several small activities in which

community members will connect with each other to discuss ideas, posit solutions and problem solve in order to learn from each other while engaging in creative activities to build individual knowledge. The completion of each activity will open up subsequent activities that will broaden the experiences available and will increase in depth and difficulty.

During the summer of 2011, the first module, *Planetary Geology*, will be offered. According to the INSPIRE OLC website, the Planetary Geology module will focus on geologic processes, planetary atmospheres, planetary surfaces, and geologic mapping in relation to NASA and its missions and objectives. In addition to the main foci, this module will also explore trigonometry, photography, scientific reasoning, mechanics, physics, meteorology, and many other areas of science, technology, engineering and mathematics. This module will be available beginning June 1, 2011, and will be available for students to participate in as much or as little as they desire throughout the summer months. This module will only be available until the end of the 2010-2011 OLC year to make way for preparations for the 2011-2012 OLC year.

Points.

Students can earn points through a variety of different methods within the OLC. The main path to earning points is through the completion of the activities within the OLC. Each activity is assigned a possible point total based upon the amount of time required to complete the activity and the difficulty level of the activity. For example, an activity with a two-star difficulty rating that takes an estimated one to three hours to complete is worth a possible fifty points. As activities are completed and submitted, the student work is reviewed and then given the appropriate number of points. The points are

monitored and updated by the OLC Activity Developer who typically updates the points

once per week. Students can also earn points by participating in Live Chats or viewing

the archive of the Live Chat at a later date. At the end of each chat, a code is given to the

students in attendance that will allow access to a specialized quiz. The quiz associated

with that chat is short and includes questions/content pertaining to that week's chat

session and speaker. Students viewing the archive will be able to receive the same code

by watching the chat through until the end. Each chat is worth the same number of points.

Additionally, students can submit blog entries for posting in the INSPIRE Blog and, upon

selection, will earn points as well. Project team members are constantly looking for

additional ways in which students can earn points through participation in chats.

Students can see the total number of points earned so far by going to the points

area of the D2L system. In this area is a list of all of the possible areas in which they

could earn points and how many points that member has earned for each area. The

student can also see how many points they have earned total. The points are gained

individually and are not earned at the expense of other students.

Point System.

A point system or classification system has been set up in order to identify the

various levels of points that the students have earned. The point system was set up to

encourage student participation and allow them to see their ranking in relation to the

other participants. The lowest level of achievement in the points system is the Aerosonde

Level indicating that these students have earned between 500 and 700 points. Aerosonde

is a low level aircraft designed to be sustainable in high wind hurricane environments. As

the students earn more points, and move up into higher levels of the point system, the

associated level is further off the surface of the earth and farther away from the earth itself. The Aerosonde Level is followed by the ER-2 Level, referring to an aircraft designed for high-altitude information gathering about Earth's resources and Earth's surroundings including celestial bodies. The highest levels of achievement within the points system are the New Horizons Level (4000-5000 total points), which refers to a spacecraft set to explore Pluto and its moons in 2015, and the Voyager Level (5000+ points), referring to a mission in which the two spacecraft are headed towards the outer boundary of the solar system in search of the heliopause, the region where the Sun's influence wanes and the beginning of interstellar space can be sensed. According to Ed. Specialist Graves, the leaderboard is a place

> where students who have achieved a certain number of points that they've earned by doing the activities, that their names are highlighted so students can climb up the ladder so to speak and get higher and higher on the leaderboard, see where they compare to other students.

Leaderboard.

The Leaderboard, which is located at the bottom of the Discover page and is shown in Figure 11, appears as a bulletin board and is a place where the names of students who have earned the highest number of points are highlighted. The students' names are posted next to an image of the craft that the level is named after. Only the four highest levels are posted on the Leaderboard. Each week the names on the Leaderboard are updated to reflect the current level of each student based on the number of points they have earned. Even if students are not in the highest four levels, they are still able to see

their level by looking below the Leaderboard at the list of the lower levels of achievement.
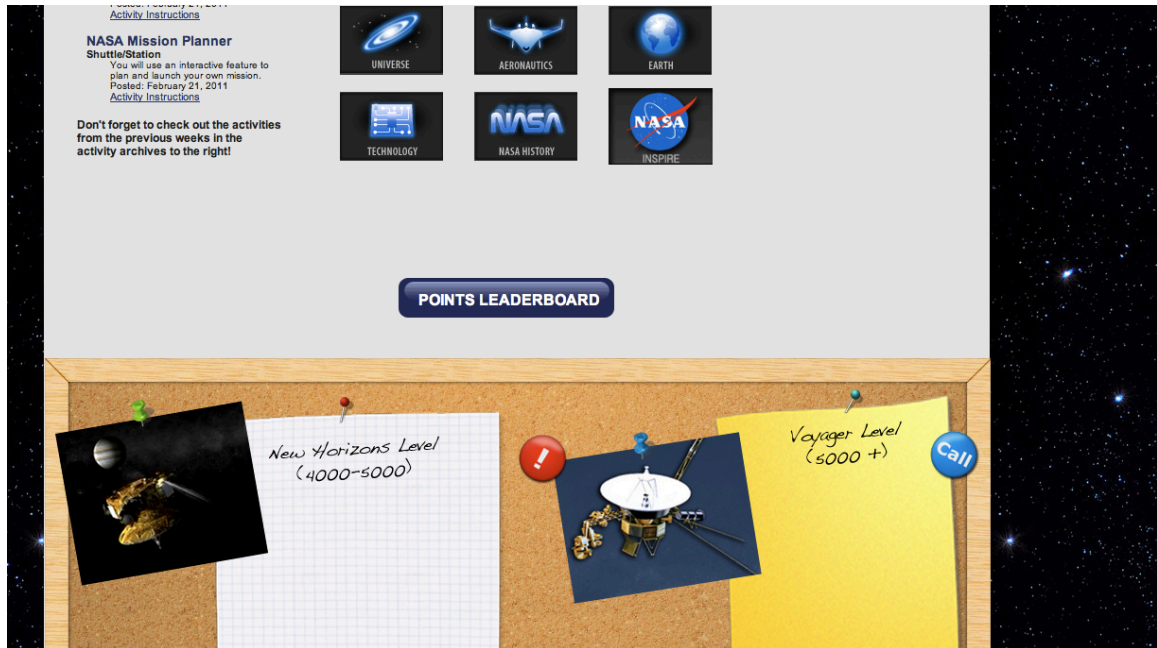
Figure 11. OLC Leaderboard. The Leaderboard is located at the bottom of the Discover page.

The purpose of the Leaderboard is to give students a place where they can visually see where they rank in comparison amongst the other students. The Leaderboard idea arose out of an annual meeting held with the OSU team and the Project Specialists, in which the Project Specialists suggested that a ranking system of some sort be developed and displayed in the OLC.

In addition to the recognition earned by appearing on the Leaderboard, student points are also used as a way to determine individual activity level within the OLC during application for the Summer STEM Experiences. According to various members of the INSPIRE project team, it is the desire of the team to further develop the point

achievement levels so that students earn special privileges, prizes or materials as they
reach each of the point levels.

Connect Page.
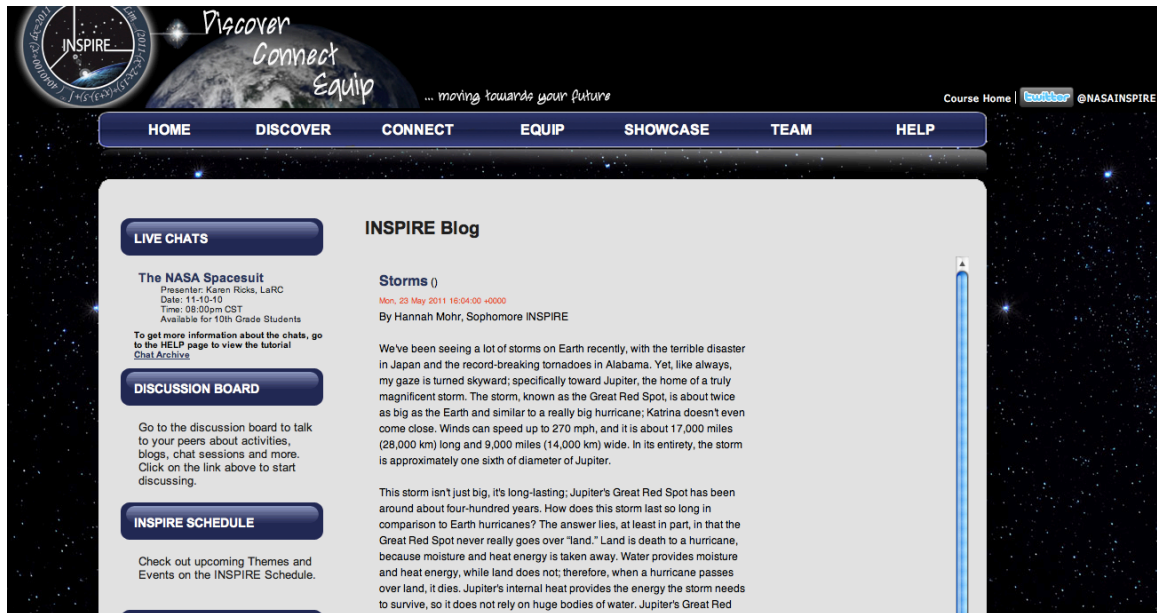
Figure 12. INSPIRE OLC Connect page.

The *Connect Page*, Figure 12, provides a place where community members can
connect to their peers, to NASA experts and to the Project Team. There are many
avenues of communication presented on this page including the Live Chat, Blog,
Discussion Boards and links to a calendar of INSPIRE events and official NASA
sponsored social networking sites.

Live Chat.

The Live Chat occurs once per week during the evening and is available for all
students to participate. The Live Chat is held using the Elluminate® system and lasts
approximately one hour. Figure 13 shows the Elluminate® software. Chat speakers are

chosen based upon the weekly theme topic. For example, Antja Chambers was the

speaker for the Microgravity theme as this individual works specifically with spacesuits

and crew survival, both of which rely heavily on knowledge of microgravity.
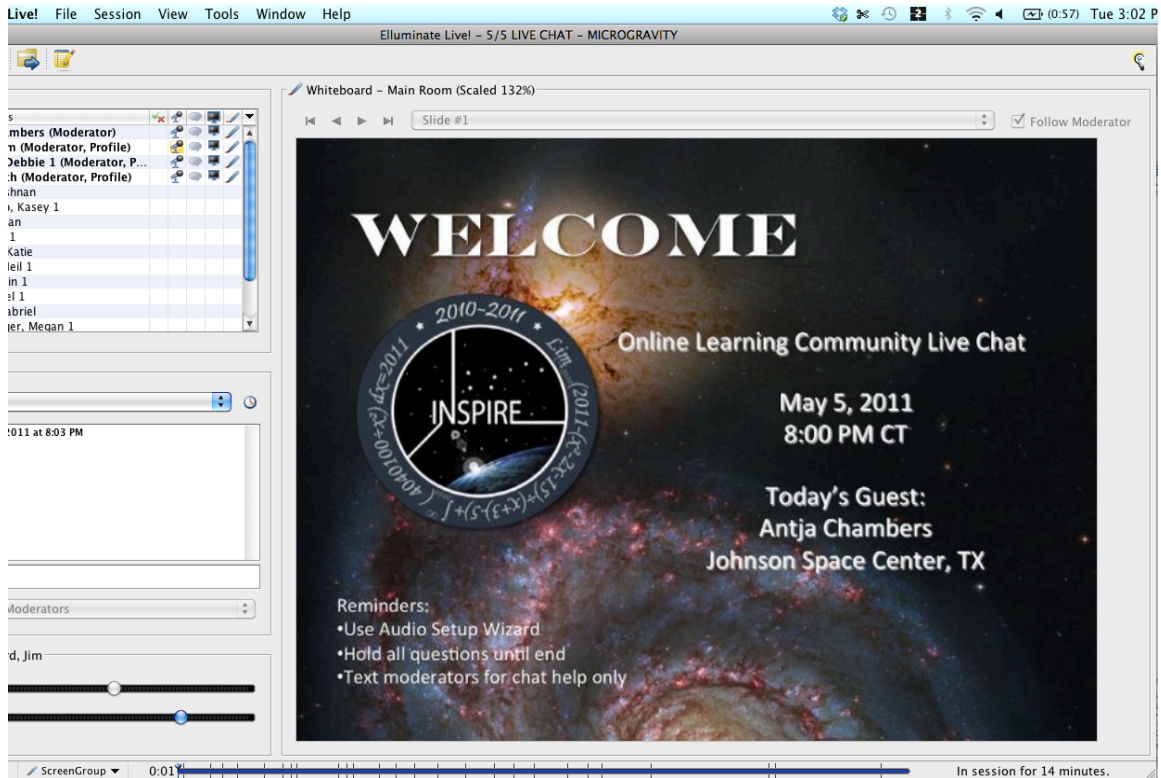
Figure 13. OLC Elluminate® Weekly Live Chat Session.

The OLC Lead Education Specialist, Ed. Specialist Graves, determines the Center

most closely aligned with the weekly theme topic and then contacts that Center's Project

Specialist. The Project Specialist then provides Ed. Specialist Graves with contact

information for an individual who would be appropriate as a representative or speaker for

that topic. Ed. Specialist Graves then makes contact with the content expert, requesting

his or her participation in the weekly chat. If the content expert agrees, Ed. Specialist

Graves gives them a walk through of the Elluminate® software and what to expect during a chat session.

The content expert will put together a presentation to share with the students, allowing the students to acquire a certain amount of knowledge about the subject, and then the remainder of the time is used for a question/answer period in which the students submit questions via the chat box that the speaker will answer verbally. This gives student the opportunity to directly interact with experts with whom they would not have had the opportunity to do so otherwise. The chats also allow students to see the broad range of jobs and careers available at NASA and gives students the chance to find out how these individuals got to where they are today. Typical questions students ask include what kind of classes did they take and how did they get that position. Ron Archer, the Assistant Principal Investigator states that not every student has a NASA Center nearby where they can go and speak face-to-face with a NASA employee, but by having this virtual community, and the Live Chats, the students have the opportunity to connect with those individuals who may be thousands of miles away from where they live. Ron noted that it is invaluable for students to see these people and to hear their stories and to learn from them.

Because of the contract with Elluminate®, only 100 individuals can be in an Elluminate® session at one time. As there are approximately 1800 students and the same number of parents, along with project team members, staff and project specialists, this requires students to sign up to participate via a Live Chat discussion board. After students sign up to participate, the OLC lead gives them access to the Live Chat session and sends a link via e-mail for the students to sign in and access the chat session.

Blog.

The INSPIRE Blog is located in the main area of the *Connect Page*. This blog is a place where students can read blog postings that are of interest to them and/or pertain specifically to INSPIRE. The team strives to have a different NASA personnel write blog entries each week uniquely for the project. Some weeks this happens and a NASA scientists or expert will write something directly for the INSPIRE students; other times the blog is written by a member of the project team (usually the OLC Lead Education Specialist) or by reposting a blog provided for other NASA sites. Students are able to contribute to the blog by postings comments or questions and are encouraged to submit blog entries to the dropbox area. Once these entries are read over, they will be posted to the blog area for all of the participants to see, and the student who wrote the blog will receive points for contributing.

Discussion Board.

Students have the opportunity to communicate with their peers by posting their thoughts, questions, opinions or even completed activities to the discussion boards and by reading others' posts. The discussion board is strictly a peer-to-peer discussion area and can be seen in Figure 14. While questions for the INSPIRE Project team are sometimes posted to the discussion board, any questions that must be answered by the project team are to be sent to the INSPIRE Help Desk, leaving the discussion board available for peer help, advice and opinions. The topics on the discussion board are monitored, and the INSPIRE team will remove any posts that are in abuse of the rules set forth for the discussion board. These rules are clearly posted in the discussion board area:

- Stay on topic. Other readers expect the posts they see here to deal with the topic at hand.

- No personal attacks. Criticism of decision-making and operational management, including the names of the individuals involved, is legitimate. Criticism on a purely personal level is not.

- No profanity. No spam. No sexually explicit or discriminatory material.

- Comments about politics and politicians must, like everything else, be on-topic and free from personal attacks.

- Because of security concerns and NASA's legal obligation to avoid appearing to endorse commercial goods or services, posts containing URLs will not be permitted.

According to Ed. Specialist Graves, "the true community is the interaction with each other which they could do through the discussion boards, through the live chats, through the challenges that they are working on." There is a space within the discussion board called the *Family Corner*. This forum is a place for caregivers to have peer-to-peer discussions and comments.

Figure 14. OLC Discussion Board.

Equip Page.

The *Equip Page*, Figure 15, provides students a place to prepare themselves for the future through access to resources that are necessary for that preparation. Many students are not aware of all of the opportunities that are available to them, and the *Equip Page* is there to highlight these opportunities and to provide the students with the resources necessary to prepare themselves for a future STEM degree and career.
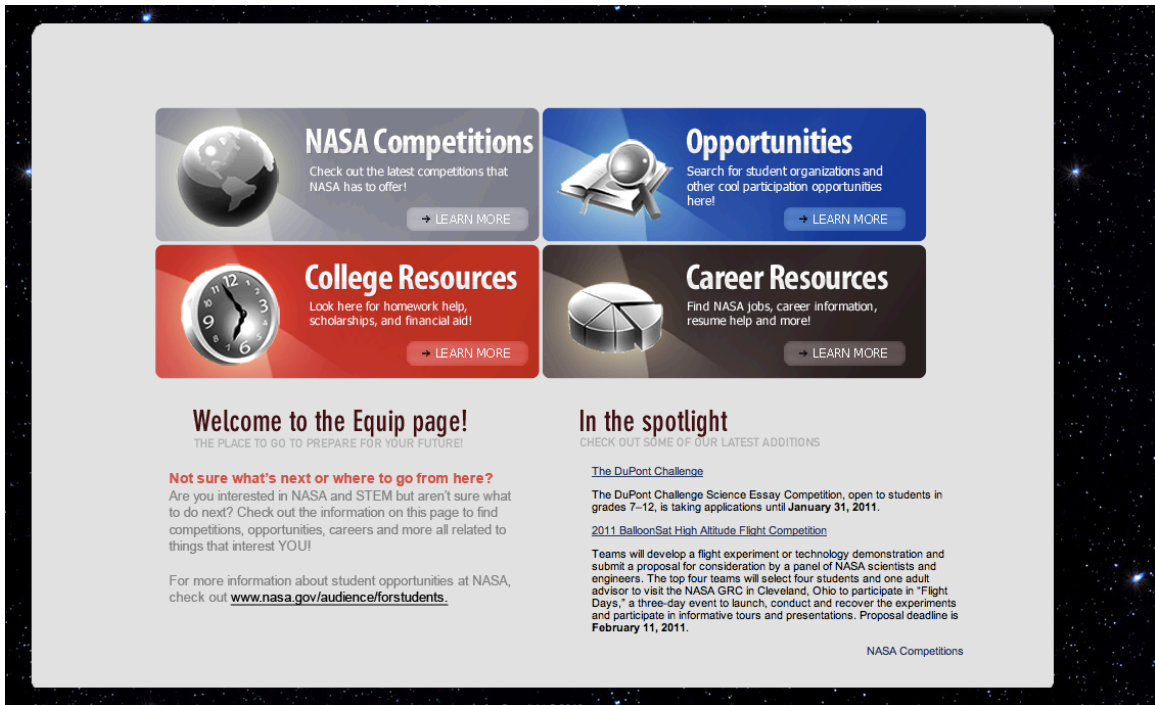
Figure 15. INSPIRE OLC Equip page.

The main *Equip Page* has links to four areas.

1. NASA Competitions. In this area community members have access to resources and information about the latest competitions hosted or supported by NASA. This includes art competitions, design challenges, contests and experiments.

2. Opportunities, provides access to information about STEM opportunities across the nation. Information in this area includes; Sun-Earth Day, conferences, events, Send Your Name to Mars, and Student Organizations.

3. College Resources, where community members can get information about homework help, college planning, scholarships, financial aid, and even links to college rankings.

4. Career Resources. Currently this area provides links to resume/interviewing techniques, career information (such as different areas within engineering and aeronautics), and information about jobs/careers at NASA.

The content within the Equip area of the OLC is constantly evolving. As new opportunities, competitions, or resources become available and/or known, the project team will pass that information along to the community members through updates to this page.

Showcase Page.

The *Showcase* is the page of the OLC that highlights student achievements with the INSPIRE project as shown in Figure 16. This page is meant to include examples of activities that students have completed in the OLC as well as winners of competitions and accomplishments during the SSE. Two main areas exist on this page: the Summer STEM Experiences (SSE) and OLC Student Projects. The SSE portion highlights vodcasts and abstracts created by the SSE students during the 2009 SSE as well as the vodcasts and photo journals developed during the 2010 SSE. The OLC Student Projects area showcases the 2009 Lunar Habitat Challenge and the 2010 Patch Design Competition submissions as well as the ISS Challenge.
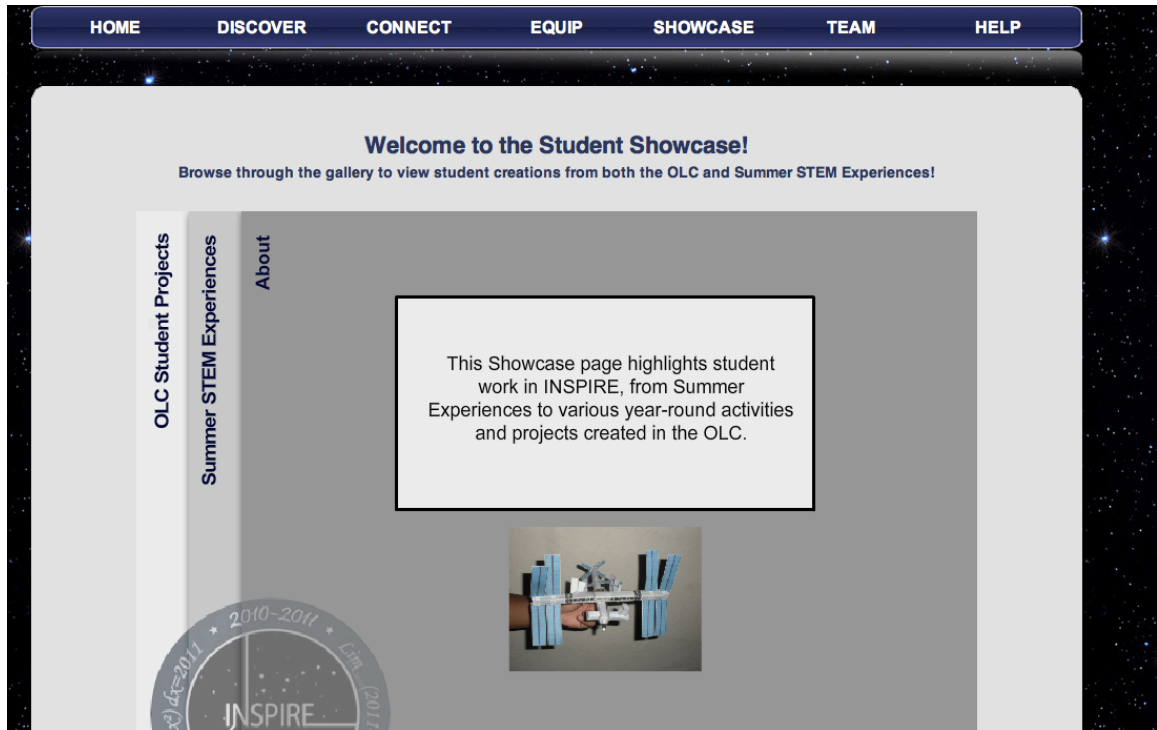
Figure 16. INSPIRE OLC Showcase page. This is the main screen of the INSPIRE Showcase.

Currently, the *Showcase Page* is not living up to the expectations of the project team according to Ed. Specialist Ives. She states that while some of the content desired is present within the showcase area, the team feels that this is an area that is severely lacking within the OLC. The education specialists are looking to evolve this area significantly over the course of the next few months and desire this page to really expand to include a "Wall of Fame", highlighting student national achievements outside of the OLC as well as achievements inside. Additionally, more effort will be placed on updating this page on a regular basis. Currently the page is updated once a year or every six months or so. Ed. Specialist Ives states that this page is also in the process of a complete redesign to create a cohesive look across all aspects of the *Showcase* to better allow for

the showcasing of student products, achievements, contributions and will allow students to share their work with the rest of the community.

Team Page.

The *Team Page* is an area of the OLC in which students can learn more about the individuals who make the INSPIRE Project work. A picture, job title, and a short bio are provided for each individual highlighted on this page. Individuals who appear on this page include all three Education Specialists, OLC Administrator, the Media Specialist, the IT Specialist, the Project Manager, the Principal Investigator, and the Assistant Principal Investigator.

Help Page.
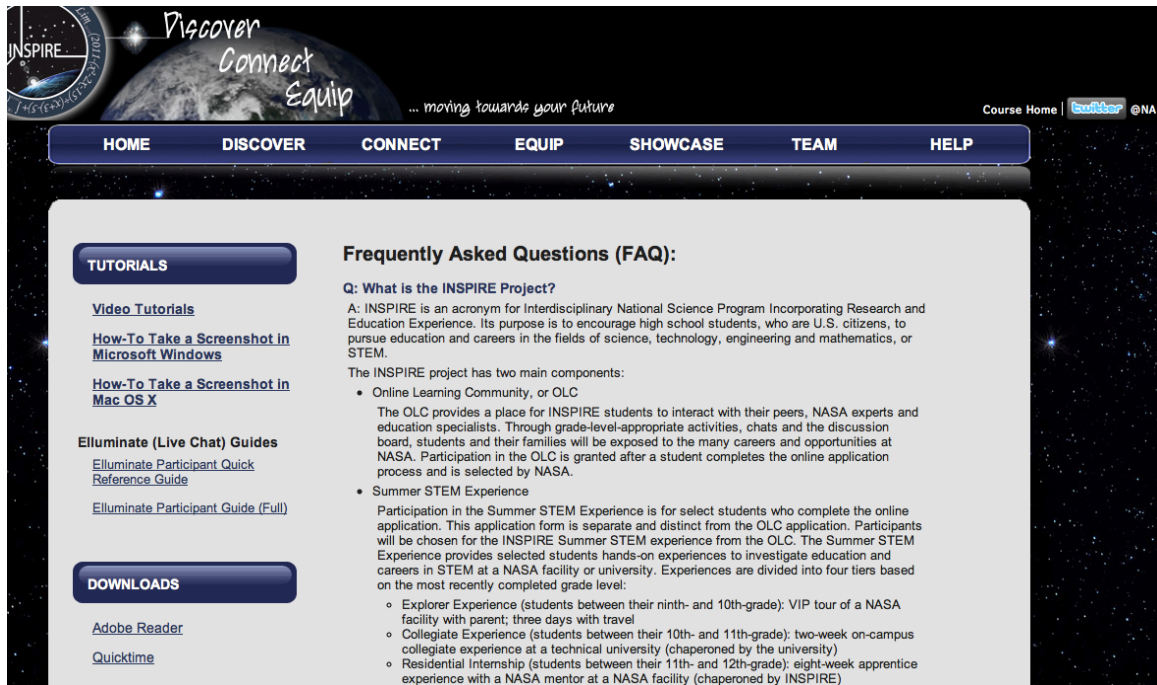
Figure 17. INSPIRE OLC Help page.

The *Help Page* provides a place for community members to look for immediate answers to common questions, as shown in Figure 17. The small column on the far left includes a tutorials section which include video tutorials for the OLC, How-To documents for taking screen shots, and Elluminate® (Live Chat) guides. Additionally, links to download Adobe Reader and QuickTime are provided. All documents posted to the OLC can be read using Adobe Reader and all videos can be viewed using QuickTime. There are also links to the Rules/Regulations documents, technical support and a list of contact information. The main column on the right provides a list of frequently asked questions and the answers to those questions for easy reference.

OLC Rollover.

At the end of the OLC year, it is necessary to switch content and user login information from the previous year to the new year's content and user login information. This process is unofficially called the "OLC Rollover". As the students are required to reapply each year in order to continue participation in the OLC, it is necessary to take time between the OLC years to remove old login information and upload new login information. The OLC is available 24 hours a day, 7 days a week for the entire year, except for a 2 or 3-day period in August to allow time for the OLC rollover. The rollover requires the OLC Administrator to remove all content from the previous year and upload all new content and gives the administrator the chance to make a variety of updates and major changes to the look/feel of the community at that time. Additionally, the IT Specialist takes this time to remove all login information for student and parent community members and upload the information for all students who have been accepted

for the next year and to reset their access, requiring the students to retake the

rules/regulations quiz and the pre-OLC experience survey each year.

OLC Progression

While the OLC has been in existence for about three years, it has evolved and

changed fairly dramatically during that time. According to the External Evaluators, the

goals of the OLC have remained the same, partially due to the fact that, as a NASA

contract, the goals are decided upon in advance and cannot be altered easily. However,

the OLC has changed to better meet the goals and according to the team itself, the

INSPIRE Project Team has become better prepared and educated to meet the goals, and

the team has increasingly met the goals with more options, as is evident in the evaluator's

reports.

In particular, the visual design of the OLC has changed drastically. Evaluator Donaldson,

states that, initially, the OLC website did not use the terms *Discover, Connect, Equip* to

identify visually with the goals of the project or as an organizational source; this was

added at the start of year two of the OLC. Additionally, the Leaderboard is a feature that

was added during year three to encourage student participation. According to Ed.

Specialist Ives, the Education Specialists have a better understanding of the online

community from an education standpoint than they did when beginning the project,

which helps the team make improvements that are the most effective for engaging,

encouraging, and helping the students. Additional social components have been added to

the OLC including the introduction of the INSPIRE Twitter site and adding the Poll of

the Week as a discussion starter, both during year three. In the beginning, most of the

effort was devoted to the development of the learning management system and solving the challenges associated with that.

According to Dr. Aberthy, during the first couple of years of the project, the structure of the project was loose, and there were quite a few people involved that did not have a very good understanding of what they should do and what they could contribute. This lead to a first year that was devoted to just getting things done, attempting to meet deadlines and minimum requirements, and looking at how to recruit students and convince them to participate. So, during the first year a lot of time was spent on figuring out what each individual project team member should do and how to meet the requirements of the project. Dr. Aberthy states that the second year allowed for some progress to be made rather than meeting the minimum requirements of the project. Additional content was developed and advances were made in the quality and quantity of the content. According to Dr. Aberthy, there were still adjustments being made in that individuals were still finding their niches and others were figuring out who was best suited to do what jobs and what jobs were necessary. The second year also saw the addition of the first Activity Developer whose sole job was to put together the activities rather than splitting time between various commitments in addition to developing activities. This allowed other individuals more time to devote on improvements to the community and allowed the focus of the project to shift from meeting the minimum requirements just before the deadline to allowing the team to try to build upon the good, remove the bad and push the boundaries of what has been seen and done in informal online learning communities.

According to all three education specialists, in the future, the INSPIRE Project Team would like to see a push toward activities that are less school-like and more enjoyable for students to participate in. Ed. Specialist Ives states, "there is always the need to tweak everything to make it a little more focused and a little bit more interesting and a little bit more desirable for the students in the community."

Limitations

Desire2Learn.

Working with a learning management system can be difficult at times when dealing with the development of a nationwide online community. The ways in which the D2L courses are set up reflect a traditional, formal online classroom and it can be difficult to mold that environment into one that works for informal education and for this project. This has forced members of the project team to find "work-arounds" that allow for the development and improvement of the OLC experience. One such example involves the evaluation procedures. According to OLC Administrator Gardner, in order for the third-party evaluators to get the data they need for the evaluation of the project, a special data gathering and export procedure was set up by D2L specifically for the INSPIRE project. Additionally, it has become necessary to bypass much of the D2L interface in order for the OLC to appear as a regular webpage rather than a classroom, and there are limitations in the types of coding that can be used in the pages created in order for the page to run properly in the D2L environment. Finally, the discussion board area is one in which the project team would like more control of the look/feel as well as the organizational structure. That level of control is not available due to the way in which the discussion board feature is set up within the D2L environment.

Minors.

Many limitations have arisen during the course of the project that can be traced back to the fact that the project deals directly with students under the age of 18. According to Assistant Principal Investigator, Ron Archer, there are a lot of legal issues that have to be addressed to ensure that the environment in which the students are interacting remains a safe environment for them and that the organizations that are sponsoring the project, NASA and OSU, are protected as well. This is a concern that weighs heavily on decisions made for the project both inside and outside the community. Another concern, expressed by Ron Archer, is that the students must be over the age of 13 years old in order to be able to participate in this community due to the Children's Online Privacy Protection Act (COPPA). This is important when considering advanced students who may be ninth grade students but are still under the age of 13.

The desire expressed by Assistant Principal Investigator Ron Archer, is for the OLC to be able to develop through more interaction among the students and their peers, to be able to interact with less of a veil between the students, but the hurdles necessary to get to that point have been slow in developing. Activity Developer Carver states that with the vast amount of resources available on the Internet, particularly in the form of Web 2.0 tools, there are a great many things that could make the activities and content within the OLC more interactive and interesting but would require the students to leave the safety of the password protected environment set up for them within the OLC, putting them at risk.

According to Ron Archer, initially, the project did not allow much student-to-student communication, which, as the project developed, was seen as a detriment to both the students and the project. This has slowly evolved over time with more areas in which

students can share and interact with each other becoming available. Each step in this direction, however, takes time to implement with a great deal of forethought being devoted to ensuring that the next step is worthwhile and will still protect the students personal, identifiable information (PII). Assistant Principal Investigator Ron Archer explained that,

> the challenge is that you can't have just a totally open interface. I think we are all spoiled by Facebook, and I can't even name off all the different social networking type of environments, twitter and all those.

Small Staff.

Lead Education Specialist Ives states, "we have a very uh, small dedicated staff. Uh, I think if our staff were larger there are some things that we are not currently doing that we could do." A part of the Education Specialists' responsibilities are to interact with the OLC members and to monitor the discussions on the discussion board as well as in the chats. With only three Education specialists and almost 4000 OLC members, including both caregivers and students, this is an extremely difficult task to accomplish. Ed. Specialist Graves states that just monitoring the discussion board is an extensive job, and on top of all of the other work the Education Specialists are doing, not much time is left for the one-on-one interaction that is so desirable in an online learning community. According to Ed. Specialist Ives Ives, the Education Specialists are doing a good job of interacting with the students as much as possible but would like to be able to interact with the students even more. Unfortunately, the only students that the education specialists are able to interact with in this way tend to be those individuals who seek them out. Ed. Specialist Graves further explained this frustration:

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With a community as large as ours, I am sure there are some students who have, who don't really feel like they are a part of the community because nobody's really reached out to them and tried to draw them in. And sometimes it's hard to identify those students or to see whether they're really interested in becoming part of the community…

Conclusion

The NASA INSPIRE Project is a large project, both in scope and in detail. Many individuals work together to ensure that the project runs smoothly and meets the projects' goals. Through a collaboration of effort, the team manages to run a large project regardless of the project's limitations of environment, participant age and small staff size. The next chapter focuses on the results from the data analysis including themes that were present in the interviews and documents.

CHAPTER V

CASE ANALYSIS

The purpose of this study is to develop a model of informal online learning

communities based on theory, research and practice. This chapter will present the themes

uncovered in the case study process based on the methods outlined in the methodology

chapter. This will be followed by the presentation of the commonly identified features of

informal learning and an online learning community based upon the research from the

Literature Review.

INSPIRE OLC Themes

In analyzing the data collected for this study and presented in chapter 4, the

following six themes emerged: building community for knowledge development, student-

centered environment, uniqueness of project, evolution through evaluation, time and

space, and semi-informal practices.

Building Community through Knowledge Development.

There are two facets or visible goals to the OLC, dividing the focus of content and

dividing the attention of those working within the INSPIRE project: knowledge

development and building community.

Knowledge Development.

OLC members are given many opportunities to develop knowledge about STEM and NASA related topics. Evaluator Davidson describes

> in many senses, [the OLC] offers students opportunities to actively participate in the development of their own knowledge through the activities, discussion boards, and sessions that are offered which challenge student's understanding and require of them a level of activity and engagement that would encourage them to develop their own knowledge and understanding.

OLC members have many opportunities to work on their own and develop their own individual knowledge. Additionally, the OLC members are provided additional options that allow them to work with other individuals, students who are like-minded, to develop a community of knowledge.

An online learning community can be a difficult type of community to develop. Many times a focus on learning will overwhelm the development of the community and/or the focus will be on the development of a community with the expectation that knowledge development will result as a by-product of community development. Developing a balance between the two is difficult but an essential aspect to the development of the INSPIRE OLC. There is interdependency between the knowledge development and building community within the INSPIRE OLC, separating this project from others of its kind. Knowledge development is a central goal to the project and is highly desired by NASA forcing the project team to determine a way for the two goals to work side by side rather than being exclusive of one another. Initially, the knowledge

development goal was disjointed from community development, with each individual of the project team working towards varying goals for each. Over the course of time, the INSPIRE project team has been able to meld the two together, encouraging knowledge development within a variety of STEM and NASA related topics by using the community as a driving force behind learning. This is reflected in the views of the project team who stated that this is a "different kind of learning experience" for the students and that this approach is "helping them learn more about the world that they normally wouldn't get through the classroom." Ed. Specialist Graves states,

> Part of having knowledge and really having that knowledge as part of you is being able to share it and communicate it effectively. And so this is done, through students, through the creation of, it might be a PowerPoint presentation, it might be a brochure, it might be a website or a poster and by doing that the students helps to integrate that knowledge within them that they've learned.

As students are creating their own knowledge within the OLC, they are able to share that knowledge with other students, enhancing the community and, conversely, the community allows for more learning opportunities as students share their own knowledge, interests and questions.

Community Development.

Working side by side with knowledge development, the INSPIRE project team works to bring together a community of like-minded students, individuals with similar interests and passions, who can come together and learn from each other as much as they learn from the activities and other content. Members of a community, whether face-to-

face or online, are individuals who come together with a common identity or purpose. A review of the literature reveals that an exact definition of *online community* is difficult to come across with any amount of regularity (Parr & Ward, 2006; Preece, 2000; Souza & Preece, 2004). This variation within the literature can make it difficult for a project team to come together on a definition as well. During the first year of the project, the project team struggled as they tried to develop a community while working with vastly different definitions of what an online learning community truly should be and how it should be developed. Over time, the INSPIRE team has developed a commonly shared understanding of an online learning community, bringing cohesiveness to their efforts. The Annual Evaluation report states that development of the INSPIRE Online Learning Community provides "the capability for [the students] to interact, ask questions, and share knowledge with their peers through participation." The team agrees that they are providing a place for students to interact with peers and experts and are engaging students in learning, STEM and NASA. PI Marsh stated that what "we have now is an online learning community. I had some preconceived ideas of what that was but in reality it has turned into a much more in-depth, richer environment for students to interact with NASA."

This shared definition of community allowed the project team to progress in the development of an online learning community. The team works toward the development of an online learning community by focusing on four main areas: communication, interaction, collaboration and participation. Additionally, the project team focuses on motivation, both internal and external, as a means of increasing participation.

Communication.

The literature states that effective and regular communication is one of the most widely indicated success factors within online education and learning in general. Communication opportunities are evident throughout the OLC website and throughout the plans of the INSPIRE project team. The Evaluation Report states that the project team makes "the OLC more of a medium for information exchange among students for group/community and learning/discussion" by offering more communication opportunities "(both synchronous and asynchronous) in discussions and chats." According to Ron Archer, the project team strives to create communication opportunities so the students can "have conversations, allowing them to make connections amongst themselves." These connections allow for relationship building leading to a greater sense of belonging and a greater connection to the community.

Interaction.

Yang (2009) states that knowledge is a product resulting from interaction. In addition to developing content knowledge, the OLC strives to create a sense of community through many facets, one being interaction between community members. Interaction goes beyond mere communication opportunities by allowing students to talk, share and get to know those with whom they share the community. Ed. Specialist Graves states, "The true community is the interaction with each other." The INSPIRE project team feels that interaction is an extremely important facet of community development. Activity Developer Carver expressed this feeling by stating,

> I think the interaction is important because [the students] need to feel like they are a part of something. They need to feel like they are being heard … nobody wants to go and be the only student in a classroom and so students get involved with this

not only to experience something like INSPIRE but also because they know they are going to be able to interact with others and be able to share their work with others, and they are going to be able to learn from the others' work. It's important because students need to be able to learn from each other as well as from the experts. But they need to be able to feel like they are part of something, not out there all by themselves.

The INPSIRE project team works hard to provide opportunities for OLC members to interact with each other and with individuals outside of the community in INSPIRE unique opportunities. Ed. Specialist Ives states

it starts with the interaction we have on the chats, when we have subject matter experts and the students have an opportunity to ask questions. And that to me is a very high level way to interact. All the way down to when the student has a question, we have a help desk and a toll free number and then in between there we have all kinds of things. Students have an opportunity to post their questions and their comments on the discussion board; they have interaction there. When they're working on the challenges they are assigned a discussion board so that's where interaction between the students come in. The INSPIRE staff [has] interaction on the discussion boards as well. We give the students an opportunity; they have opportunities such as writing a blog, their own blogs, where students can comment on the blogs of other students. So, we have an interaction too. We have a poll of the week where the students can give their opinions, and I consider this a form of interaction as well.

According to Ed. Specialist Graves, the two main opportunities that OLC members have to interact with individuals outside of the OLC are through the INSPIRE blog and the weekly Live Chat. According to Ron Archer, the OLC

> allows connectivity across the US which most students aren't going to get that exposure when we go to school … or even after school programs in our local community. So what this does is allows them to hear thoughts and opinions on the same subject from students in different, not only geographic but cultural differences here in the US and I think that is a lot of knowledge that they gain.

Collaboration.

A way in which the team provides for interaction and communication opportunities is by providing group projects. The use of virtual teams or groups of students within online learning environments has become highly encouraged due to the communication technologies that are now available to students and educators. These technologies enable group collaboration through multiple communication channels (Janssen et al., 2009; Penzias, 1995; Yoon & Johnson, 2008). Implementing online learning groups can improve cooperation, collective knowledge, diverse perspectives and resource sharing (Townsend et al., 1998). What differentiates online learning groups from traditional work groups (which rely on physical proximity) is the ability for students to work together and create products together regardless of time zone or location (Lipnack & Stamp, 1997; Putnam, 2001).

During year two, the project team began providing additional opportunities for students to work collaboratively with other students to complete a variety of different

types of activities and challenges. The Evaluation Reports indicate that students highly value these opportunities and the networking opportunities that they provide. Activity Developer Carver

> learned quickly that, something that was really important to the project was that it tried to involve not only the students as individuals but the students as a group. [We] tried to get these students to work with and off-of one another and get them to really function as a community of learners as well as try to involve the family into the community of learning as well.

These group collaborations provide opportunities for peer-mentoring, allowing the students to learn from each other as well as from the content within the OLC.

Participation.

The Evaluation Reports indicate that students and parents place a high value on participation within the OLC. Just logging on or reading the information is not enough. "Participation is key. With active participation in the discussion board, chats, surveys, and activities, you will definitely gain valuable insight and knowledge that will help you to prepare yourself for a future in STEM and with NASA."

One key aspect to keep in mind is that student participation is not required as a part of membership in the OLC. OLC members are encouraged to participate as must as possible with the knowledge that the more the OLC members participate, the more knowledge they will gain and the stronger the resulting community will be. The INSPIRE project team "consistently remarks on the unique experience provided by INSPIRE and the extent to which students gain knowledge and exposure as part of their participation."

The Evaluation Reports and Project Team members also state numerous times that

student participation varies over the course of the OLC year, increasing as students'

outside demands, such as school and school related activities, decrease, especially during

the holidays when time allows additional participation.

The INSPIRE Project Team has consistently encouraged participation in the OLC.

Evaluator Davidson states that the addition of the leaderboard raises the predominance of

student participation. "I think that was a great way to encourage students to participate

and it seems to have done that."

Motivation.

The Project Team acknowledges that a key aspect of participation is the OLC

members' motivation to participate. Motivation has been linked to participation in

various aspects of the literature. Specifically, self-regulation, through increased

participation and interest, has been shown to be a key success factor within online

learning communities (Artino, 2008; Seddon, Skinner, & Postlethwaite, 2008). The

INSPIRE project team works hard to provide for external motivation within the

community by encouraging participation. According to Evaluator Davidson,

> INSPIRE works to inform through news offerings, discussion board postings,
>
> looks to engage through content that's appropriate and interesting for students.
>
> And works to encourage students to participate in, and grow their understanding
>
> of NASA and STEM careers and information.

In addition to the leaderboard, students are encouraged to participate by being informed

about things happening in the OLC. Tools such as the eINSPIRE and the Twitter feed

both serve to provide reminders that there are things happening within the OLC and to provide encourage and motivation to log in and participate. According to Evaluator Davidson, an OLC member "can be a lurker in discussion board topics and if a topic was a topic of interest for that student that would motivate that student to participate in that discussion board."

Additional motivation comes directly from the OLC members. Ed. Specialist Ives states,

I think they motivate each other, I think they raise the bar for each other because they're very competitive … they do not want to be out done on the challenges, they want to win. They want to be the best … They have an opportunity to ask our scientists and engineers questions and they are very competitive even in that. They want to ask the hardest questions and the best questions.

In the upcoming year, the INSPIRE project team plans to provide additional motivators to the OLC members through the development of a Wall of Fame. This area will highlight student achievements outside of INSPIRE. Education Specialist Wallace (Ed. Specialist Wallace) states,

We have a lot of students doing things outside of the OLC; they're doing things for their school, their community. Some have won regional and national awards, and we just think it would be nice to show other students. Personally I think it would be motivating to others to say, hey, this kid can do it, why can't I?

According to Ed. Specialist Ives, this provides motivation because

we all like to be recognized for a job well done. For one reason, we just like the recognition but the other reason, is it motivates. It motivates both the person being recognized and it also motivates other students to want to be recognized and therefore motivating them to achieve beyond what they normally would because they know the recognition would happen.

Evaluator Donaldson indicates that access to an exclusive site can increase motivation:

> We know from motivation theory and learning theory and research and those areas that when people have exclusive access, which is part of the community, when they have privacy, which is part of having to log in. When they sign up then all those things increase their motivation to pay attention. And paying attention, we know, leads to greater interest and knowledge.

A focus on student interests is another way that the INSPIRE project team builds motivation. As the students see that their interests, thoughts, opinions and choices are being heard, their internal motivation increases. As students find things that interest them personally, they become more motivated to participate and become active members of the OLC.

The codependency between knowledge development and building community is a unique aspect of the INSPIRE project. Websites like Facebook are available for community building but these sites focus only on community with no knowledge development component. Other websites such as Dictionary.com is focused on knowledge development with no real concern for the development of a community. Many

sites that claim to be online learning communities tend to focus on one area or the other, ignoring the knowledge development for the sake of community building or vice versa. INSPIRE would be completely different if knowledge development and community building were exclusive of each other. INSPIRE builds a community through knowledge development.

Student-Centered Environment.

The second theme that emerged from the case study data is a student-centered environment. Literature on both informal learning and online learning communities state the need for the environments to be student centered. The INSPIRE OLC is student centered by highlighting student choice, focusing on student interests, promoting student created content, making opportunities available for student leadership and providing resources to prepare students for their future. Ed. Specialist Ives says,

> Because not everyone learns the same way, not everyone has the same interests, and what excites me about something I want to learn about may not excite you, and vice versa. And that's human nature. We cannot assume all students learn and think the same way.

Student Choice and Interest.

OLC members have the ability to choose the information they access, the activities they participate in, the projects they complete, the chats they participate in, the blogs they read or write, and the discussion boards in which they participate. The project team consistently states that participation is voluntary. Additionally, the team states that the students have the ability to choose their path within the OLC and can focus on areas

of interest to them. Students are able to "delve as much into things as they would like to" where "students take the initiative" to go out and find information on their own. The OLC gives them an "avenue to do that" allowing the students to go beyond just the learning that takes places within an activity by providing additional options for individuals to pursue.

While student choice plays a role, so does student interest. The project team takes into consideration what the OLC members like, what their interests are, and what types of activities/challenges they enjoy, which are made apparent through the inclusion of the Student Advisory Council, a student group that offers advice and input on a variety of OLC content options. Additionally, the Education Specialists look at learning styles and the way in which students learn to help "guide" the way activities and other content are developed.

Student Created Content.

Student created content will play a central role in the OLC in years to come. With the development of a new and improved *Showcase* page, there will be a centralized place in which student content can be featured. This area is highly anticipated by the project team as individuals await a place where students can be featured and can share their work with their peers, providing an opportunity to compare their work with others. Additionally, the discussion board is a place in which student created content allows OLC members to post and discuss the content they have created. Activity Developer Carver talks about how she was pushed to create activities that allowed students to "publish their work" and "receive feedback from other students," which would allow for a "constant communication within the learning community." Student created content allows for more

"social" aspects to come through by showcasing who their students are, what they know, and what they care about to other community members, "[be]cause that creates the connections."

Student Leadership.

The INSPIRE OLC also exhibits a desire to develop student leaders. Leadership can increase student responsibility of their actions both inside and outside of the community. Responsibility can encourage students to work harder, focus more, and share their knowledge with others. According to Evaluator Donaldson, with this group of students, "more of them like to be leaders than not."

Students' Future.

There is a major focus within the INSPIRE OLC to prepare students for their future: not just a generic future that could apply to any number of students, but to give students the skills and the knowledge necessary to make choices and prepare themselves for the their future college and career choices within STEM and NASA. With a focus on "college prep" and "NASA Careers," the OLC team has provided many avenues for students to learn about what interests them and how they can incorporate that information into their decision making process. With the NASA pipeline in mind and trying to prepare students for STEM fields, the OLC team provides information for students that can be used during high school and when choosing a college, making career choices, or getting jobs.

Each of these areas combines into an environment that is focused on the students' needs and desires. The project team works hard to focus the OLC on the students rather

than only developing information that they deem relevant. This is especially evident in the existence of the Student Advisory Council, which provides feedback, suggestions and information on what students want to see most. Additionally, polls provide information that guides the actions of the project team and allows them to make informed decisions about what the OLC members want to see and do within the OLC.

Uniqueness of Project.

The third theme that emerged from the data was the uniqueness of the NASA INSPIRE Project when compared to other projects. Three things emerged from the data that set this project apart from other, similar endeavors: the emphasis on family involvement; a clear and direct connection to experts; and the immense, nationwide scope of the project.

Family Involvement.

An extremely unique aspect of the INSPIRE project is the focus on parent/family involvement. This focus sets it apart from many other student centered online communities, which encourage students to participate on their own and have no encouragement to include their parents and other family members in on their learning or their online experiences. The INSPIRE project, on the other hand, places a large emphasis in parent and family involvement. While this involvement has not be high in the past, it is increasing as the OLC project team finds new and better ways to engage the parents and family of the students in the OLC. Striving to include parents and family in the students' experiences does not set the project apart from others alone, the unique aspect of family involvement centers around the scale to which this is being done. Many

entities understand the value of parental involvement in a students' educational

experience, and according to Dr. Aberthy,

> kids obviously grow up with their parents. Before they go to school they learn
>
> everything from their parents, and grandparents and family. Family should be a
>
> key central part of any informal learning environment. And I believe one of the
>
> reasons why OSU got the award in the first place was that their conceptualization
>
> of informal learning included parents. Now, we all know that parents are grown
>
> up adults who have jobs, and sometimes [it's] not easy to get them involved in
>
> this kind of project but this again is something that separates INSPIRE from most
>
> other projects I've seen. I've seen a lot of projects, quite a few projects, where
>
> parent/family involvement was encouraged in different ways. There were even
>
> monetary incentives, but all these projects were on a much smaller scale. For
>
> example, a museum is conducting a workshop or an open house event, and they
>
> invite kids to come with parents. And in some projects I've seen, "the more
>
> faculty members you bring, the better stipend you receive" kind of thing. So I
>
> think that everybody recognizes the role of family and parents in informal
>
> learning, but there are a lot of challenges – just logistical challenges – and how to
>
> actually get them to participate in discussion forums, how to get them to help their
>
> kids solve this problem as a part of content learning activit[ies].

Logistical issues are at the core of what is preventing the INSPIRE project from evolving

the parent and family involvement to the level desired, but progress is being made. This

unique aspect of the project will allow students the opportunity to share their knowledge

and interests not only with their peers, but with their families as well. This idea is

reflected by statements from parent surveys and documented in the Evaluation Reports.

One parent state that the OLC "inspired me too, and now we have the SAME topics to

talk about." Another individual expands on this thought by stating that

> my level of satisfaction is due to the total involvement of both my daughter and I.
> It gave us an opportunity to gain a wealth of knowledge while spending quality
> time together, having discussions about things we both have knowledge of and
> both have an interest in.

Connection to Experts.

Participants in the OLC have the opportunity to participate in a unique aspect of

the INSPIRE project. By attending the weekly Live Chats and communicating with the

presenters, OLC members have the chance to interact with NASA and STEM Content

Experts. This type of experience is not available to the general public and is not an

opportunity that many individuals have on a regular basis. This connection to experts

allows students to learn directly from those in the field and to ask questions that can

further guide their education and the decisions they make.

The weekly chats provide OLC members, parents and students, the chance to get

to interact with NASA experts. These experts share their stories, provide guidance,

answer questions and provide content knowledge on a variety of topics related directly to

OLC member interest. Ed. Specialist Graves said he'd

> often heard said, if there's something you want to do, find somebody who's doing
> it and then watch them and copy them. And you know, if you wanted to be a ball
> player, you'd go down to the ball park and you'd watch those players do what

they do, and you'd try to copy them, you'd try to emulate them. You might try to

get in a position where you can work along side of them and so that you can be

close to them and learn from their experiences, and we provide that in a virtual

sense. Not every student is going to have a NASA Center near by where they can

go down and speak to people who are involved in aerospace engineering or

developing the next generation of civilian aircraft or the latest propulsion systems,

but yet, by having this online learning community, this virtual community, we can

bring students from wherever they are, as long as they have a computer, as long as

they have an internet access, we can provide them with that opportunity to see

these people and to hear their stories and to learn form them.

Large Scope.

The scope of the project is another unique aspect of the INSPIRE OLC. Many

online learning communities are found in traditional educational settings and consist of a

typical number of classroom students. Some online learning communities will, at times,

reach numbers in the hundreds, but rarely does an online learning community strive to

reach thousands of students and parents from the across the U.S. over four grade levels.

The large scope of the project provides unique experiences for the students, allowing

like-minded individuals from across the nation to connect, an opportunity not available to

every individual.

Evolution through Evaluation.

The fourth theme that emerged from the data analysis was evolution through

evaluation. The INSPIRE OLC exhibited, in many ways, that it is an ever changing, ever

evolving entity, which requires constant examination and evaluation in order to maintain

the high level of content that the community members are used to and expect to see. In order for the community to evolve toward better areas, rather than changing for the worse, evaluation, both internally and externally, is necessary to ensure that the team is prepared and that the community members are engaged.

The OLC project team, including the External Evaluators, is constantly evaluating the state of the project and how the team is meeting the goals of the project. Evaluation data comes from both the project team itself and from members of the OLC. These members provide feedback that allows the project team to make "informed changes" based on what is necessary and desired rather than just through guesswork. Evaluation has led to the development of clearly identifiable goals that can be used as a basis for future evaluation. The project is under constant evaluation to ensure that nothing remains overlooked or hidden for long. Issues or problems become apparent quickly allowing for changes to take place with little delay reducing the impact that these issues have on the general OLC population. The evaluation also lets the project team know what is working within the community so that what is working can be enhanced and highlighted.

Constantly Changing.

It is important that the content remains up-to-date with the current times. This means updating news and placing content within the OLC that reflects what is happening in the real-world, during present times and not leaving outdated or irrelevant data. The result is an ever-changing, ever-evolving OLC in which the content updates at the same pace as the information outside the OLC.

The OLC does not change drastically overnight. A great deal of preparation and planning goes into the development of each and every change, ensuring that the changes instigated are for the betterment of the learning community. Adapting to a changing environment and a changing population keeps the content from becoming stagnant but allows it to stay rich and useful to OLC members. Slow evolution results providing a smooth transition from one change to the other keeping pace with the world in which students live their lives. Today's youth expects, and perhaps even needs, to stay in constant contact with up to date information. They are quickly bored when presented with the exact same information in exactly the same way, and constant stimulus is necessary to maintain focus. Evaluation leads to constant evolution, which gives the students new and fresh information and things to explore.

Time and Space.

Time and space was a theme that developed over the course of the data analysis process. Specifically, the ability for students to access the OLC regardless of location and time of day gave students the freedom to learn and interact at a time of their choosing. Time, a burden usually associated with formal education settings, was no longer an obstacle. In traditional education settings, educators are forced to squeeze as much content into as small a time frame as possible with little time allowed for preparation, grading, or reflection. Students rarely have access to teachers outside of the allotted class time requiring students to figure things out on their own with short deadlines.

The INSPIRE OLC does not run into these common time constraints. Materials are available to participants at any time of the day, allowing OLC members to log in and access what they need, when they need it. There are few deadlines, allowing students to

work on activities, challenges, polls, and other interactive material as they had time available, allowing the OLC to meld to their schedule rather than expecting OLC members to shape their schedule around the OLC. Even scheduled items, such as the weekly chats, are available after the fact in an archive. If a student is unable to attend the chat live, they are able to watch the archive, receive points and ask questions (via the discussion board).

Time was often mentioned in conjunction with the space involved. The environment in which the community members interact with each other appears to play a role in the development of the community. Many individuals spoke about the look-and-feel of the environment and the role that it plays in the students' desire to participate and the amount of time spent participating. Providing an environment in which individuals interact gives community members a sense of belonging and a space that they can call their own. This provides a sense of ownership and enhances desire to continue participation. The way in which the environment works and looks influences the way in which individuals participate and the amount of participation. The look and feel changed dramatically between years one and two giving "focus" to the community and by "visually retooling the online community." It now more closely reflects the project's design and intention "dramatically" improving the online community itself "as well as encouraging students."

Individuals also mentioned the desire to bring things from "outside" the OLC to "inside" the OLC. By giving students a place to highlight their outside achievements with the Wall of Fame, the project team provides an additional avenue for students to feel connected to the OLC. Rather than experiencing the OLC in the online environment and

then leaving that environment to experience the "real-world," students can bring the real-world into the OLC by bringing information in and can bring the OLC into the real-world by sharing their knowledge with family members as well as through participation in the Summer STEM Experiences (SSE).

Semi-Informal Practices.

The final theme that emerged from the data was semi-informal practices. There are aspects of this project that exhibit both informal and formal/traditional approaches to education and even community building. Both aspects, informal and formal, are necessary to the successful implementation of a project such as the INSPIRE Project.

Learning Ecology.

There is a connection between what is learned in this informal environment to what is being taught in the formal environment of K-12 education. The project team exhibits a strong desire for that connection to be present and enhanced as they feel that this connection is needed in order for students to get the most out of their experiences. What is learned inside of school, or other formalized learning situations can stimulate interest in a particular topic or subject, motivating individuals to "seek more information, opportunities, and like-minded people" (Greenhow & Robelia, 2009, "Exploring the learning", para. 4) with whom they can learn and grow outside of a traditional, formal setting. Conversely, what is learned outside of formal educational settings can influence what is learned within by sparking interest in a particular topic, which can lead to the selection of a certain set of courses, projects, or workshops. This perspective is referred to as a *learning ecology.* (Barron, 2006; Greenhow & Robelia, 2009) According to

Greenhow and Robelia (2009), the learning ecology perspective can help to bridge the gap between what is learned at home, in school, at work or within the community.

This concept is reflected in the approach of the INSPIRE Project Team. According to Ed. Specialist Wallace, "a lot of students … that have experience with some of this stuff outside of the OLC, they bring that knowledge to the OLC, and so I think that it incorporates that way." Activities found inside the OLC environment have application outside as well:

> In some ways, we might be able to connect them back to school. We urge the students to go back to their schools and to share that information with their teachers, with their classmate or to other students who are younger than they are.

The completion of OLC activities are things they can "take to the classroom" and to science fairs. This connection back to formal education settings gives the OLC project team a unique opportunity to reach students where they are and help them move forward both in terms of personal growth but also in terms of their school knowledge and confidence. Many informal learning settings do not focus on this connection back to schools, to the detriment of the participants.

> Museums and zoos and all of these other … traditional informal educational institutions, they often focus on the hands-on activities … which is great but they don't necessarily do a good job connecting these hands-on applications to the formal curriculum, to what the kids actually study in school.

This lack of a direct connection can lead to a disconnect between what students learn in informal settings and what they are expected to know and understand in formal settings.

This is exemplified in the context of educational games. While educational games can be very motivating for students to participate in, Dr. Aberthy suggests that these games may not do a great job of connecting the game to what students learn in class.

> I actually see kind of a problem there [be]cause if I were a student and I go to class and I study certain things and concepts, scientific concepts often have Latin names and its known that they are not very easy to understand and to process and to internalize. And then I play this informal science game and everything seems so clear and understandable but there is this disconnect between what I study in school and what I do out of school as a part of my informal learning program. I think there is often times this disconnect, which I think also contributes to students' understanding and perception of sciences as a boring subject. Why doesn't the teacher play games like that with us and that kind of thing? Which, obviously you need both. You need to have these kinds of experiences but you also want to understand the connection, the theoretical concepts and application of these concepts in the STEM fields.

In order to connect what is learned in an informal learning setting to what is being taught in formalized educational settings, it is necessary to combine informal and formal educational practices. Both types of learning opportunities and teaching practices are found within the NASA INSPIRE OLC.

Informal Learning within the OLC.

There are many aspects of the OLC that are considered informal in nature some of which will be explored at the end of this chapter. Several individuals within the project

team indicated a desire to make the OLC "fun," "less supervised" and more "self-directed." These concepts are essential to informal education. The OLC is seen as a place that is relaxed and gives students the opportunities to choose what activities to participate in with little to no direction from outside forces. Additionally, there are no grades associated with learning, removing the pressure to perform well on exams and allowing students to learn from their mistakes as well as their successes. Assistant Principal Investigator, Ron Archer, states "classrooms were not relaxed when I was a kid, and whenever we went to boy scouts, which to me was informal learning or I went to the museum, that was fun and it was just less stressful." The project team works to bring informal education practices into the online learning community environment by making the activities "less school oriented" focusing more on creativity through the development of products or the completion of experiments.

Traditional Education Elements within the OLC.

The informal learning aspects are only a part of the educational approach of the INSPIRE OLC. Many aspects of formal or traditional education came through during the data analysis, indicating that adhering to only one approach, (formal or informal) to an online learning community may not be necessary. For example, the INSIPRE project team relies heavily on standards based resources, specifically NASA approved educational materials, indicative of a formal approach. These materials have all been approved as being educationally sound based on standards. Educational standards are not typically of concern to those working with informal education but play a vital role as the foundation for many of the informal learning opportunities available in the OLC and provide a connection to what OLC members are receiving outside of the INSPIRE

project. Additionally, while the project team strives to provide the students with opportunities to make decisions and to follow their interests, there are a few cases in which the project team does in fact guide rather than facilitate. The activities are a prime example. While students may choose which activities to participate in and they do have the ability to learn from their mistakes, many of the activities have step-by-step procedures that indicate which direction the students must go in order to complete the activities. This, again, provides direction to ensure that the students are able to make the connections between what they are learning in the INSPIRE OLC and what they are learning in school. Along the same lines, much of the content is determined by the moderators of the site, specifically the Education Specialists and the OLC Staff. While student interest and knowledge level is taken into consideration, the content itself is determined and developed by the moderators rather than letting the OLC members determine and develop all of the OLC material themselves. This allows the OLC project team to ensure that there is a broad range of information available so that each and every student can find something of interest to him or her.

Rather than focusing on one particular approach to education within the OLC, the project team melds both informal and formal educational practices to create a unique experience for members of an online learning community. Assistant Principal Investigator, Ron Archer, explains that

> Everyone in there is learning and teaching … they're sharing some of their experiences and so its not necessarily a traditional model of an educator lecturing to a student. It's more of a conversation … We do actually use NASA education

activities that we've revamped to use in an electronic environment, and hopefully

make it fun learning for the students.

These six themes have provided a basis for examining the NASA INSPIRE

project as a real-world example of a successful online learning community. The

following section will outline the defining aspects of informal learning and online

learning communities as described in chapter 2.

Informal Learning – Literature

The informal learning definition chosen for use in this study is based upon the

NSTA position statement (1999), which stipulates that informal learning (within a

science education context):

- complements, supplements, deepens, and enhances classroom studies;

- emphasizes creativity through the need to attract non-compulsory audiences;

- does not use a formal set of guidelines, objectives, or curriculum to guide

  interactions between participants or state what participants should gain from

  interactions with media;

- extends to the affective, cognitive, and social realms;

- presents opportunities for mentors, professionals, and citizens to share time,

  friendship, effort, creativity, and expertise with youngsters and adult learners; and

- allows for different learning styles and multiple intelligences and offers

  alternatives for non-traditional and second-language learners.

This definition also includes certain guidelines to follow which will be helpful in

identifying common structural elements that exhibit and enhance informal learning.

Online Learning Community – Literature

Through the examination of the literature surrounding online learning and online communities, as well as review of online learning models, the following list has been compiled from the literature and models discussed in chapter 2 and was determined to reflect successful online learning communities based upon current research.

- Create a student centered environment
    - Constructivist approach
    - Moderators, not instructors
        - Ensure that the moderators are ever present but are equally unobtrusive being aware that the focus is facilitating learning and community experiences not instructing.
- Develop a variety of different types of activities and experiences to keep students engaged
    - Using both synchronous and asynchronous communication techniques
- Develop a sense of community through:
    - Communication between community members and moderators
    - Group collaboration
- Provide external motivation while presenting an emphasis on self-regulation/internal motivation
- Design a userfriendly environment

INSPIRE OLC and Literature

Tables 5 and 6 provide evidence of both informal and online learning community techniques exhibited in the INSPIRE OLC aligned with current literature.

Table 5

Evidence of Informal Techniques in the INSPIRE Online Learning Community

Review of Informal Learning Literature	Evidence in INSPIRE OLC
Complements, supplements, deepens, and enhances classroom studies;	Connection between knowledge development and building community; use of NASA approved and standards based materials;
Emphasizes creativity through the need to attract non-compulsory audiences;	Design challenges; presentation type activities; sharing products on the discussion boards;
Does not use a formal set of guidelines, objectives, or curriculum to guide interactions between participants or state what participants should gain from interactions with media	No grades; no minimum participation requirements; few deadlines or timeframes;
Extends to the affective, cognitive, and social realms	Sharing in the discussion boards; interacting with peers in live chats; writing and posting student created blogs;
Presents opportunities for mentors, professionals, and citizens to share Time, friendship, effort, creativity, and expertise with youngsters and adult learners	Weekly live chats with experts and INSPIRE project team; discussion boards to post questions for live chat presenters;
Allows for different learning styles and multiple intelligences and offers alternatives for non-traditional and second-language learners	Students can choose what to learn and how; many options available in activities and challenges; variety of different activity types and categories are available that students can choose from;

Table 6

Evidence of Online Learning Community Techniques in the INSPIRE Online Learning Community

Review of Online Learning Community Literature	Evidence in INSPIRE OLC
Create a student centered environment	Participation is based on student choice; there is evidence of student created content and opportunities for students leadership; Student Advisory Council provides for student input;
Constructivist approach	Scaffolding activities through modules; Students are "on their own" in completing activities;
Review of Online Learning Community Literature	Evidence in INSPIRE OLC
Moderators, not instructors	Education Specialists are not teachers in the traditional sense; Students choose what to do and can learn from their mistakes; Education Specialists monitor the discussion board, they do not lead it;
Develop a variety of different types of activities and experiences to keep students engaged	The various different types of activities ranging from presentation to modeling to experimentation; Choices between blogs, Live Chats, activities, polls, discussion boards and group challenges to give students options;
Using both synchronous and asynchronous communication techniques	Live Chat for synchronous communication; discussion boards, blogs, emails for asynchronous communication;
Develop a sense of community through communication between community members and moderators	Students can interact with other community members through discussion boards and chats; Interaction with moderators through email, Live Chats, discussion boards, blogs, and surveys;
Develop a sense of community through group collaboration	A variety of group challenges are offered periodically throughout the year; Students can choose groups or be assigned to groups randomly;
Provide external motivation while presenting an emphasis on self-regulation/internal motivation	Content in OLC is based on real-world, current events making the content and activities meaningful and authentic; Students are constantly encouraged to login in and participate through eINSPIRE and Twitter feed;

| | Showcase and Leaderboard are encouragements to participate; |
| Design a userfriendly environment | Look and feel is updated based on user needs; Students have input through Student Advisory Council; Monitoring Help Desk and technical support discussion board to make changes and updates; Review surveys to determine user needs and desires for the use of the environment; |

Conclusion

Clearly, the INSPIRE OLC meets criteria found in the literature for informal learning and online learning communities, but there are elements that make it successful not present in literature on informal learning and online learning communities. Formal education techniques such as connection to the real-world and the use of education standards as well as scaffolding, rewarding not grading and using evaluations to inform decisions were all components which helped make the INSPIRE project successful. Chapter 6 will combine theory and practice in presenting a new model based on data from this study interacting with current research.

CHAPTER VI

MODEL, IMPLICATIONS, RECOMMENDATIONS

The purpose of this study is to develop a model of informal online learning communities based on theory, research and practice. This chapter will present a new model followed by identifying the implications of this research and future research recommendations.

Semi-Informal Online Learning Community Model

The initial purpose of this research study was to develop a model for informal online learning communities under the assumption that the NASA INSPIRE Online Learning Community (OLC) was an informal community in practice. However, through the course of the data analysis it became apparent that the community that has developed within the INSPIRE OLC cannot be categorized as a strictly formal or informal environment. Many indicators of formal/traditional education methods are present. Greenhow and Robelia (2009) describe formal education as a formal learning situation in which the students' learning is guided through a formal set of objectives that are generally created by an outside authority. Aspects of this are apparent in the INSPIRE OLC through the use of standards based materials and scaffolding activities such as modules. However, this community cannot be categorized as a strictly formal

environment as the INSPIRE OLC meets all of the requirements of informal learning as

defined by the NSTA (1999) and allows individuals to make their own journey down an

educational path of their choosing (Walters, 2009). The INSPIRE project models both

formal and informal learning, as characteristics of both are present within the community.

A semi-informal environment takes an informal learning approach and supplements it

with formal educational strategies. A new model is necessary that can combine both

theory and practice as no model currently exists that efficiently provides for a semi-

informal environment. Figure 18 illustrates the Semi-Informal Online Learning

Community Model based on the NASA INSPIRE Project that has emerged from the

intersection of the literature and the INSPIRE case study.

Semi-Informal Online Learning Community Model

based on the NASA INSPIRE Project

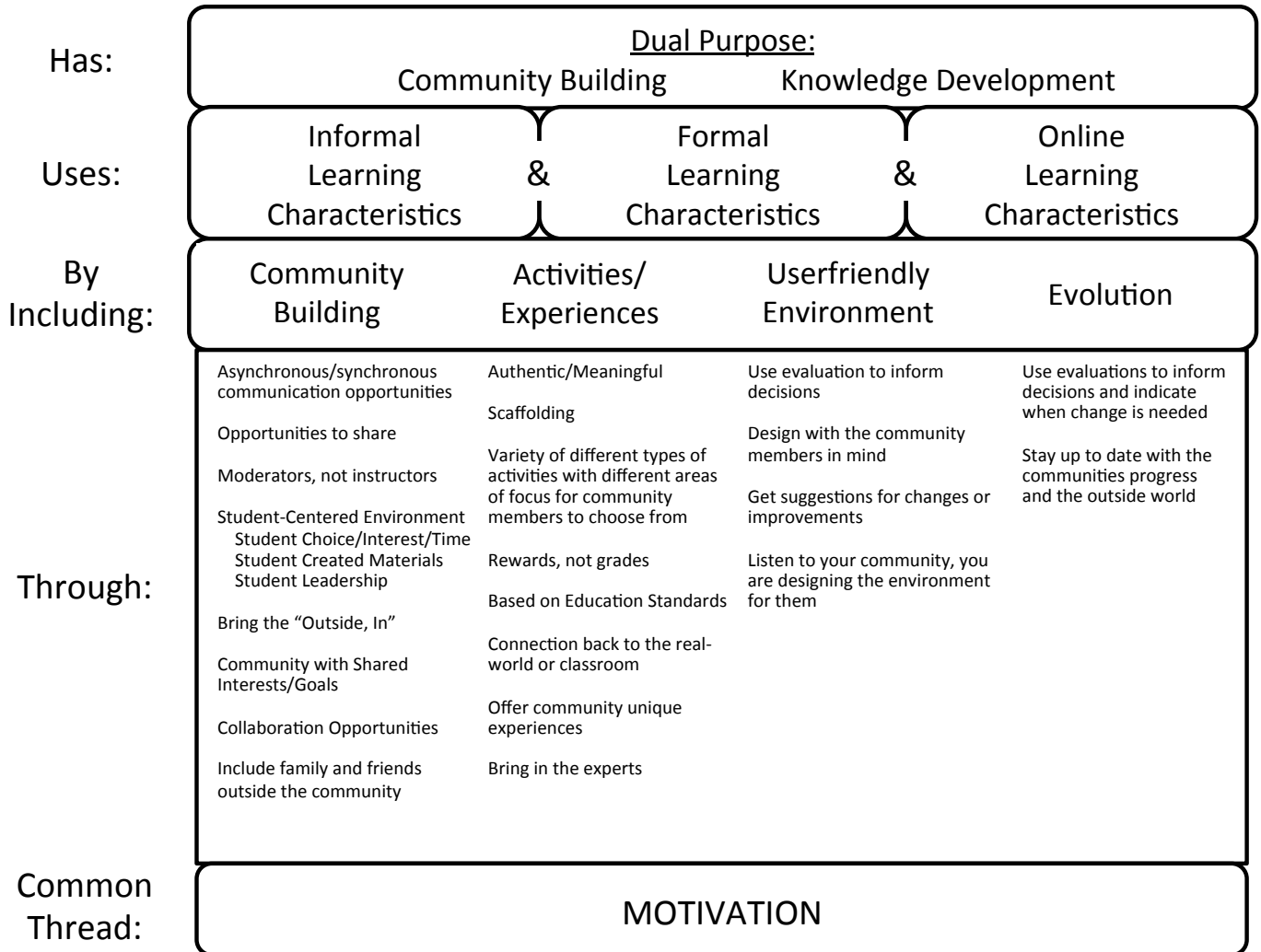|				
Has:	Dual Purpose: Community Building Knowledge Development			
Uses:	Informal Learning Characteristics	& Formal Learning Characteristics	& Online Learning Characteristics	
By Including:	Community Building	Activities/ Experiences	Userfriendly Environment	Evolution

Through:	Asynchronous/synchronous communication opportunities
	
	Opportunities to share
	
	Moderators, not instructors
	
	Student-Centered Environment
	   Student Choice/Interest/Time
	   Student Created Materials
	   Student Leadership
	
	Bring the "Outside, In"
	
	Community with Shared Interests/Goals
	
	Collaboration Opportunities
	
	Include family and friends outside the community
		Authentic/Meaningful
		
		Scaffolding
		
		Variety of different types of activities with different areas of focus for community members to choose from
		
		Rewards, not grades
		
		Based on Education Standards
		
		Connection back to the real-world or classroom
		
		Offer community unique experiences
		
		Bring in the experts
			Use evaluation to inform decisions
			
			Design with the community members in mind
			
			Get suggestions for changes or improvements
			
			Listen to your community, you are designing the environment for them
				Use evaluations to inform decisions and indicate when change is needed
				
				Stay up to date with the communities progress and the outside world

Common Thread:	MOTIVATION			

Figure 18. Semi-Informal Online Learning Community Model based on the NASA

INSPIRE Project.

Dual Purpose.

When creating an online learning community of any kind, it is important to first

look at the purpose of the community being created. If the focus is more on knowledge

development than on community development, use of a formal online education model may work best. An example of this type of environment includes formalized online training courses in which the material is presented, a quiz is taken and a grade is given. On the other hand, if the focus lies more with the development of a community rather than knowledge development, use of an informal learning model may be most beneficial. For example, Facebook is an informal community where knowledge development may occur but is not provided for or expected. The INSPIRE project, however, has a dual purpose working to build a community *through* knowledge development. When examining the online learning community under development, determine if the purpose aligns with that of the INSPIRE project. The term semi-informal has been used to identify the type of online learning community model in that all aspects of informal learning are present while only some aspects of formal learning exist to help further the dual purpose.

Combination of Characteristics.

These dual purposes of knowledge development and community building are accomplished using a combination of informal, formal and online educational characteristics. It is necessary to ensure that aspects of each are present within the OLC to provide opportunities for learning and sharing. Strictly using formal education characteristics are inappropriate in an online environment that also has a goal of building community. Formal education is traditionally face-to-face taking place in real-time. A focus on online education characteristics, however, will result in a more formalized feel to the OLC, as most research and models within online education stems from formalized higher education environments. Finally, informal learning characteristics focus on the

students' choices and interests. In this case using strictly informal practices would drastically change the nature of the program. A focus on informal characteristics would allow for the development of a community, but there would be less opportunities for knowledge development, because with informal learning practices, the concern is that learning occurs regardless of future application of that knowledge.

Elements to Include in a Semi-Informal OLC.

In order to create a successful semi-informal online learning community that includes informal, formal and online characteristics, it is necessary to include aspects of community building, provide for different activities and experiences, develop a userfriendly environment and ensure that the community is ever evolving. Each of this areas are necessary components found in both the literature and through the results of the INSPIRE case study and are described in detail below.

Community Building.

A focus on community building is one part of the dual purpose necessary for implementing a semi-informal online learning community. In order to build a community, several elements must exist to provide the necessary opportunities for a community to evolve and be sustained. Communication, in the form of open discussion and discourse among students allows students to learn from one another through interaction, feedback and the testing/refining of positions and ideas (Addesso, 2000; Baglione & Nastanski, 2007; Brooks & Brooks, 1993; Clark-Ibanez & Scott, 2008). Communication is the foundation of any online community. Clark-Ibanez and Scott (2008) indicates that scholars are in agreement that learning and critical thinking happen best through interaction and discussion with peers, allowing for diverse interpretations

and requiring that students defend and reform their ideas. Communication involves both communicating with other community members and communication with the moderator of the community. But this communication cannot occur in only one form. A staple of informal learning is that there is choice when participating and a benefit to learning online is that time becomes an irrelevant factor allowing individuals to participate at a time of their choosing. Providing for synchronous communication opportunities is extremely important, allowing students to communicate in real-time when desired through chats and instant message opportunities. Additionally, providing asynchronous opportunities allows students to have experiences in the outside world because they can participate in discussion boards and blogs, responding on an as desired basis and can ask questions as they occur rather than waiting until they are communicating synchronously.

Sharing.

A community also provides a place for students to share with their peers. This can range from sharing the results of an experiment (part of formal knowledge building) to sharing a first place finish in a competition at their school (informal, not related to content). By sharing with each other, OLC members are building real connections and are becoming invested in each other and the community. These connections cause individuals to feel tied to the community, resulting in an increased desire to return and participate as they feel that they are being heard and that others are interested in the things they are doing. The INSPIRE project provides for opportunities to share through the discussion boards, providing places for students to post the results of the activities they complete and discuss with other individuals their results. Students can also share with each other by writing blogs that will be posted for other students to read and comment on providing

opportunities for members to provide extensive commentary on things that are of importance to them and to the community as well. The addition of the *Wall of Fame* will provide opportunities for students to share their accomplishments outside the OLC with fellow community members.

Moderators, not Instructors.

A focus on providing moderators, not instructors, is necessary to develop and sustain a strong online community. As participation in a semi-informal OLC is not mandatory, the moderator can provide encouragement for members to participate. Gray (2004) points out that through effective moderator strategies, a moderator can sustain a community through the "anticipated ebbs and flows of interactivity" (p. 32) and to facilitate learning experiences. This requires a focus on facilitation rather than instruction. According to Gray's (2004) study, moderator techniques that were deemed to be effective included: "summarizing, weaving, and nudging the discussion to a deeper level" (p. 31), which helped the members of the community to construct meaning; the creation of seasonal online polls that allowed for quick information gathering and provided an opportunity for members to participate anonymously; scheduling live chats on specific dates; opening new discussion threads as necessary; and sending private emails to thank individuals or to invite individuals to post on a topic related to their personal experiences. Facilitation can be accomplished by allowing community members to explore topics of their choice and by providing support during the process.

Student-Centered Environment.

A student-centered environment is a necessity in a semi-informal online learning community and can be provided for in several ways. The first step in creating a student-

centered environment is to provide the students with choice. This can range from choice in the types of activities they participate in, a choice in the types of information they explore or a choice of when they participate. Each of these allows for community members to make decisions based upon their personal interests. This means releasing control of what community members do when they participate and instead focusing on things that are of interest to them. The most things they can find that are interesting, the more they will participate and the more they will learn. Giving community members choices and options with no requirements allows them to feel that they are in control of their experience and that the things they choose to participate in are meaningful to them. Individuals who are forced to participate in a particular activity are less likely to find meaning in that activity and will put forth less effort to complete it but if they have a choice and they choose to participate, they will find meaning in it and will try harder as the activity will be of interest to them.

The second step in creating a student-centered environment is to allow students to create materials that are useful to the community. This means that community members create products that will be present in the community and will have purpose beyond just their individual knowledge. Creativity competitions in which the winner's product is used in the community can be extremely valuable and encouraging. Activities in which the resulting products will be used as resources for future activities are educational as well as providing students with the opportunity to see their work put to use.

The third step in creating a student-centered environment includes providing students with leadership opportunities within the community. The INSPIRE project does this by asking individuals to participate in a student advisory council. Those in leadership

positions feel a stronger connection to the community and an increased desire and responsibility to see the community thrive. This drive and responsibility will cause these individuals to participate more themselves and to listen to what their peers need and want so that they can work to provide that for them as well. Giving students different opportunities to speak up and step out lets them know that their thoughts and opinions are being heard and that their interests play a vital role in the development of the online learning community.

Bring the Outside In.

An area lacking within many online education models is a focus on the outside world, things that are taking place beyond the community and outside of the online environment. Additionally, many informal opportunities tend to focus only on the informal learning experiences with little regard for what happens in the real world. This, unfortunately, causes a disconnect between what is being learned in informal and online education and what is being taught in the formal classroom as well as a disconnect between what is being learned and what students need to know to be successful in a real world environment. The Center for the Advancement of Informal Science Education (CAISE), with support of the National Science Foundation, published a report of an inquiry group that explored the relationships between science education in formal and informal settings. This group found that collaborations and a connection between formal and informal learning can "lead to conceptually rich and compelling science learning programs that build on the structural and social affordances of informal settings and objects" and can "lead to the creation of learning communities that develop practices,

dispositions, and understandings that are valued across multiple institutional settings and boundaries" (Bevan et al., 2010b, p.15).

Bringing the outside in has two facets. First, there must be a focus on real world applications and a connection to formal education. This is accomplished through authentic, meaningful activities and experiences as well as basing content on formal education standards. Secondly, there needs to be a connection to what community members are doing in their everyday lives to what is going on in the online learning community. It is important for students to not see the community as a separate entity from the rest of their lives but to see it as an integral part finding information and opportunities within the community that can be shared with those outside the community as well as providing ways for individuals to share what is going on in their everyday lives with members of the community. An example of this would be the INSPIRE OLC's Wall of Fame that will be instigated in the next OLC year. The Wall of Fame will be a place where students can connect their accomplishments outside of the community with those inside, showcasing their accomplishments and awards in a variety of areas ranging from sports to robotics competitions. By bringing the "outside, in," participation in the community will feel like an extension of their normal lives rather than something separated from it.

Shared Interests and Goals.

One aspect that has made INSPIRE successful is that the community members all share not only common interests but goals as well. The INSPIRE project team frequently refers to the community of "like-minded" students with "shared interests." The breadth of the content in the community is wide spread, encompassing all of science, technology,

engineering and mathematics as well as a focus on all that is NASA. The community

members still have common ground and interests in education and careers in STEM and

at NASA. This common interest ties them together and gives them common ground to

start their community experience and to begin making connections with fellow

community members. But this community goes beyond just shared interests; these

individuals also have shared goals. While not everyone in the community is interested in

working for NASA in the future or working in aerospace technology, each individual

within the community has shown that they are conscious of the choices that they must

make in the upcoming years regarding education and career decisions. This goes beyond

just being curious about the same topics; students within the INSPIRE OLC can connect

on a deeper level because they are all looking towards the same goals.

It is important within a semi-informal online learning community that the

members have a connection beyond just similar interests and tastes. A common goal or

outcome helps the individuals connect and to feed off of each other. As an individual

accomplishes a task or masters a particular knowledge area, their accomplishment can

drive other individuals of the community to push themselves, to work harder or just to

communicate more as they work to understand how it can be done.

Collaboration Opportunities.

Having a shared goal can be facilitated through the creation of opportunities for

community members to work collaboratively. This goes beyond just sharing information

or results of an individual project. It is necessary for students to work together and

collaborate on activities and experiences to come to a common decision or common

product. This allows students to create a network within the OLC. According to the

research on informal learning in the workplace, Eraut (2004) suggests that a network of resources within one's own organization can be created and sustained through the development of a group climate for learning, working as a team through collaboration. This 'learning environment' of collaboration can lead to an increase in competitive advantage as well as innovation, productivity and growth by giving the individuals the opportunity to use feedback and encouragement to share learning experiences (Sambrook, 2006, p.97-98). Additionally, literature on online education indicates that implementing online learning groups improves cooperation, collective knowledge, diverse perspectives and resource sharing (Townsend et al., 1998) and what differentiates online learning groups from traditional work groups (which rely on physical proximity) is the ability for students to work together and create products together regardless of time zone or location (Lipnack & Stamp, 1997; Putnam, 2001).

Include Family and Friends.

The groups created within the community can be a valuable resource for students as they work towards common goals but the groups created can go beyond just individual community members. One aspect of the INSPIRE project that was both unique and a contributing factor to its success was a focus on involving family and friends outside of the community. Providing opportunities for parents/caregivers to participate in the community and in chats helps the entire family unit feel connected to the community, giving an entire family common ground. It also allowed family members the opportunity to learn and become interested in the same things that their students are interested in, providing common areas of communication. A vast amount of research has been done into the impact that family, and especially parent, involvement has on the educational

success of the students, but most online communities and many informal education opportunities provide little focus or opportunities for that connection. It is important to not just expect community members to share with their family and friends but to encourage them to do so. Reminding students to share what they have learned with those outside the community is one way to do this. Also, creating activities that require more than one individual to be physically present, such as an experiment, encourages students to bring in friends and/or family to assist giving them opportunities to, again, connect the outside world with their online community experiences. Providing opportunities to involve family and friends allows those individuals to be sources of encouragement to the online learning community members.

Activities/Experiences.

Community building within a semi-informal online learning community is vitally important and can be accomplished through many of the techniques discussed above. In addition to community building however, a semi-informal OLC also has knowledge development as a purpose. This is what makes it different from most informal environments. Within informal education, learning is a by-product of the experience. Students will learn as a result of walking through a museum or playing a specially designed game. Additionally, this learning is disconnected from what is learned at school or in other areas of informal education or life in general. This results in surface learning where students gain some information but rarely understand how it fits into the bigger picture. A focus on knowledge development, however, needs to go beyond the surface learning and provide opportunities for students to learn and understand at a deeper level and to be able to connect that knowledge to other areas of education and life. Within a

semi-informal online learning community, providing activities and experiences, each with a focus on deeper understanding and connections to other knowledge, is extremely important and can be accomplished through a variety of techniques described below.

Authentic/Meaningful.

One way to provide for a deeper level of knowledge development is to create activities and experiences that are both authentic and meaningful to the individual members. Artino (2007, 2008) indicates that in order to help students develop and maintain high levels of self-regulation and motivation, instructors of online courses can help set reasonable and obtainable goals as well as develop assignments that are meaningful to their education. This can be extended into informal online environments as well in that moderators of a semi-informal online learning community can create activities that are meaningful to the community members education and goals. Shea et al. (2006) indicates that creating meaningful experiences allows students to "own" their learning, giving them a greater stake in their learning and education as a whole.

Scaffolding.

According to Slough and Rupley (2010),

what children learn is dependent not only on curriculum and standards, but also by how they are engaged in the science curriculum, those experiences that they have that extend, reinforce, and stimulate them to engage in deeper processing of scientific concepts.

Stimulating deeper processing and critical thinking is extremely important in formal education strategies, many of which can be used effectively in an online environment.

Within a semi-informal OLC, scaffolding is an effective strategy that can be used in addition to providing authentic and meaningful activities and experiences. Scaffolding provides a way for students within the community to build upon previous knowledge without feeling overwhelmed. Cognitive scaffolding, as described by Holton and Clarke (2006),

> allows learners to reach places that they would otherwise be unable to reach. With the right word or question or other device a teacher may put in place the scaffolding that will allow new knowledge to be constructed, incomplete or wrong concepts to be challenged or corrected, or forgotten knowledge to be recalled. (p. 129)

Scaffolding helps to "facilitate the construction of a students' knowledge" (Holton & Clarke, 2006, p.130) by providing educational opportunities that build upon one another. As the learner becomes comfortable with a particular concept, the instructor will prompt the student with a problem that is just beyond what they can do currently requiring the students to push themselves a little bit farther in their learning and "stretches the students to move safely into a level of being moderately uncomfortable in their learning" (Slough & Rupley, 2010, p.356). Providing scaffolding within the activities and experiences within the online learning community allows students to make progress and encourages self-regulation and motivation as the students will know that they are making progress in their understanding of concepts and ideas.

Providing scaffolding can be tricky in an environment where there are no instructors, only moderators. A way in which the INSPIRE project is accomplishing this

is in the creation of the Modules. These modules are created by the INSPIRE project team, based on NASA approved materials and build upon each other, providing resources that are "just-in-time." Just-in-time resources are those resources that become available as individuals encounter a need for them. By making information and resources just-in-time, students are not overwhelmed by information they do not need but are instead provided it at a time when it will be necessary. Additionally, students are given background resources at each stage of the Module so that students can decide how much scaffolding is necessary. If they encounter a particular part of the Module that they do not understand or a concept in which they need more instruction, they are able to access additional resources that can further their knowledge and allow them to scaffold their learning.

By scaffolding activities and experiences, the semi-informal OLC will be encouraging students to move forward in their knowledge development. Rather than staying stagnant, students are pushed to complete projects that are just slightly out of their reach, learning new information and constructing knowledge along the way.

Variety.

An extremely important part of the activities and experiences offered through the semi-informal OLC is that there are a variety of different activities and experiences from which the students can choose. Student choice was discussed in detail as a method for creating a student-centered environment, and one way in which student choice can be provided for is through the activities and experiences available in the OLC. Creating just one or two activities restricts students choice and, should the provided activities hold no interest for the student, will decrease student participation. By providng a variety of different types of activities and different content within the activities, community

members will be able to find things of interest to them, resulting in an increased desire to participate and connect to other individuals and increased knowledge development.

Activities and experiences need to vary in several ways. First, there must be a variety of topics to choose from, especially when dealing with a community with as broad a focus as the INSPIRE OLC, which encompasses all of STEM and NASA. If the INSPIRE OLC were to provide only aeronautics activities, those who are more interested in studying distant galaxies through the use of satellites and telescopes would find little of interest. Secondly, there needs to be a varying degree of difficulty level. Every individual will come to the community with differing knowledge and comfort levels. It is important to provide some activities for those with no background knowledge about a particular subject and some activities for those who have studied the material thoroughly. Thirdly, a variety in the time involved with each activity is necessary. Providing some activities that take minutes to complete while other activities can take months, gives students options based upon what their schedule will allow. Similar to an informal learning experience, students have lives outside of their involvement with the OLC and may not always have the chance to participate in an activity that will require five hours to complete but may have some time between school and soccer practice to complete a 30 minute activity. It is important to provide opportunities for all members to participate, regardless of their outside commitments. Maybe they can only participate for 30 minutes today, but because they were so interested in the topic, three weeks later when they are on a break from school, they take the time to complete a 5-hour activity. Finally, it is important to provide variety in types of activities available. No individual wants to write essays every day of the week, all year, with no option to do anything else. Additionally, while some students

may like writing essays, many others prefer build a model, conduct an experiment, or other creative activities. By providing different types of activities, more community members will have a stake in the different experiences in which they participate.

Variety in activities and experiences is focused on providing a little bit of something for everyone so that all participants feel that this community is made for them. Additionally, providing variety helps to expand community members' interests, as they may discover that while they love aeronautics, the engineering activities offered were of particular interest to them, encouraging them to explore other areas of engineering both inside and outside the community.

Rewards, not Grades.

One aspect that truly sets apart a semi-informal online learning community from other informal education and formal education opportunities are rewards. In order to develop knowledge, participation is necessary. The nature of this type of community however, relies on voluntary participation that is dictated by the individual community member, not required by the moderator. In this case, providing incentives for participation becomes a helpful motivational tool for the moderator. While obtaining good grades is seen as a motivator in many formal educational opportunities, the participants in an OLC of this sort do not want or need to be graded. Learning from mistakes is just as important as learning from success. However, providing rewards to the students can increase their motivation and drive to participate on a regular basis. Rewards can take a variety of forms ranging from points and leaderboards to earning special access to areas of the community or special prizes based on participation levels. What sets this apart from many informal education opportunities is that most informal

experiences do not have any type of reward or incentives. Participation in informal opportunities are rewards unto themselves. In a perfect world, individuals would participate in an online learning community strictly for the benefit of learning, rewards can be a way to encourage students to come back time after time.

Education Standards.

Another aspect that truly sets apart a semi-informal environment from an informal one is the connection to educational standards that exists in the semi-informal environment. The INSPIRE OLC is helping students interested in STEM and NASA education and careers prepare for their future. This means that a clear connection exists between what is happening within the community to what is happening in the students' individual classrooms. Connecting their online experiences to their formal educational experiences not only provides a more meaningful experience for the students but it also helps students to further their knowledge, building upon what they learn in school with what they learn in the OLC and vice versa. Creating activities and experiences based upon education standards provides a firm foundation for future educational experiences. What is being learned in the OLC provides a connection between what is being learned in formal education and what is being learned through real world experiences.

Connecting Back to the Real-World.

In addition to the connection between formal education and real world experiences, the OLC provides a place for individuals to develop knowledge that can be applied in their everyday lives. It is important to provide opportunities for students to be able to take what they have done as participants in the online learning community and apply that to other areas of their life. An example of this would be taking an experiment

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conducted as an individual activity and turning it into a science experiment that allows the student to demonstrate the knowledge they have gained with their formal educators and peers. Another example could be through collaborative efforts with other members of the community. INSPIRE provides for this during NASA sponsored competitions such as a robotics competition. Students work as a virtual team within the OLC to design and build different aspects of a robot, which they then ship to a central individual who assembles all the different parts. The team then enters the robot in a robotics competition in which one individual attends in person and all others attend virtually. Their robot competes and wins. This group worked together as a virtual team to create something in the real world that had real world applications and results.

Create Experiences Unique to the Community.

It is also important to offer experiences and opportunities unique to the community. The NASA INSPIRE OLC is part of a larger area within NASA Education and therefore has access to many opportunities and content that is spread throughout NASA Education. While many individuals within the community may not have seen the material before, it is possible that some of the activities that are conducted within the OLC have been conducted at an individual's school before with their teacher. However, there are many opportunities for students to participate in INSPIRE unique experiences an example of which are the weekly Live Chats. Only by being a member of the NASA INSPIRE OLC can students have direct access to a different NASA scientist or expert each week, regardless of location. In this way, INSPIRE provides a unique opportunity to its community members. It is important to provide members of a semi-informal online learning community with unique experiences that they cannot get anywhere else. This

also provides motivation to participate as well as gives members a reason to talk about the community with others. This can connect them to their family and friends or even provide recruitment of individuals who would like to become new members.

Bring in the Experts.

According to the NSTA (1999), an important aspect of informal learning in science education is that an informal learning opportunity "presents opportunities for mentors, professionals, and citizens to share time, friendship, effort, creativity, and expertise with youngsters and adult learners." Bringing in individuals from who the students can learn provides community members with the opportunity to connect with those who have experiences and/or jobs similar to those in which the student hopes to one day find themselves. Being able to communicate with these individuals can help students to find guidance, motivation, knowledge and the path they need to succeed in their future.

Building a community and providing activities and experiences to community members are the two major facets driving a semi-informal online learning community. However, these areas are only possible when the environment and materials are userfriendly.

Userfriendly Environment.

Sambrook's (2006) study indicates that *userfriendliness*, which is the extent to which the material is easy to use, can be a factor in online learning. Learning materials, when used in a face-to-face classroom, do not necessarily require the same level of userfriendliness as is necessary in an online environment because when face-to-face, the trainer or educator has the ability to explain details that may not have come across during

the development of the materials. Informally this can be seen through the use of signs in a museum that guide visitors to the areas they want to see. This, however, is not typically an option in an online format in which the learning materials for the course are accessed independently of the facilitator of the course and where the learner is alone and potentially isolated. Userfriendliness of the materials is even more important when there is the added complexity of new technologies.

Userfriendliness goes beyond just the materials, however. The environment itself needs to be userfriendly as well. Ensuring that community members feel comfortable within the community is extremely important to providing motivation to participate and encouraging students to engage with other individuals within the environment. If an individual does not understand where to go or how to do something within the community environment, they feel uncomfortable and are less likely to return. Creation of a userfriendly environment can be accomplished by designing with the community members and the purpose for the community, in mind from the very beginning.

It is important to keep in mind that the community members are the individuals for whom the community is created. This means that the designer of the environment, whether that be an individual on the development team or an outside source, needs to understand the type of community and the individuals for whom the community exists. Understanding level of previous knowledge and comfort level with technology can be useful when designing the look and feel of the environment as well as the flow of the objects on the screen and the materials being used. Listening to the needs and desires of the community members, post initial creation, can be extremely beneficial in making adjustments, fixing problems, and creating updates.

It is equally important that design decisions are not made on a whim or just because someone suggests the change. Using evaluation, through surveys, focus groups or advisory councils, provides sound reasoning for any changes that are made. This keeps changes from being arbitrary but instead allows necessary changes to be made while other changes can be considered. Evaluation is also extremely important in providing for an evolving environment.

Evolution.

It is important the community not remain stagnant. It is the tendency of many online learning community moderators to create all of the material and post the material before hand and expect the community to run itself. This is not the case, however. Most individuals will become bored when faced with the same thing, day after day. It is essential that the moderator is ever present and that the community is updated regularly. These updates allow the community to progress with the needs of its members including the creation of new discussion board topics and posting relevant news information. Additionally, constant updating keeps the community current with the outside world so that information reflects current practices and procedures and that news items are relevant to current events.

Using evaluation methods should also lead to evolution, as the evaluations can be indicators for necessary change. If a survey indicates that community members do not like a particular type of activity, then adjusting future activities to reflect that knowledge will be beneficial for the community members as they see their thoughts and opinions being heard and considered. A change to the look and feel of the environment or the content of the OLC based upon feedback allows the community to better reflect its

members and increase their motivation to participate. Even finding that members are confused by instructions to an activity or using a particular tool can help guide the creation of future instructions and can lead to the creation of additional help materials.

A semi-informal online learning community has a dual purpose of community building and knowledge development which uses informal, formal and online characteristics by including aspects of community building, providing activities/experiences, creating a userfriendly environment and allowing the community to evolve over time. A central theme is present throughout the semi-informal environment that provides a driving force, motivation.

Motivation.

Motivation factors have been indicated throughout the model description, as motivation provides a common thread, and even foundation, to the development of a semi-informal online learning community. Personal preferences and needs can greatly influence learning as well as participation in a semi-informal online learning community. Sambrook (2006) identified motivation as an inhibiting factor in informal learning. If an individual has no desire to learn, they will not.

> The concept of motivation can be defined as the organized pattern of a person's goals, beliefs and emotions that the person is striving for. Motivation is force to arouse, give direction to, continue and choose a particular behavior. (Lim, 2004, p.164)

Commitment of the individual to learning can also play a role in motivation.

Persistence in any type of distance education course can be adversely affected by a variety of factors and with the shift from instructor-centered to student-centered education found in online learning environments, greater responsibility for learning is falling to the students themselves (Artino, 2007; Kearsley, 2000; King et al., 2001; Schunk & Zimmerman, 1998). In order for students to be successful in an online learning environment, they must have a high level of self-regulation and motivation; academic self-regulation referring to the way in which students adapt their cognition, motivation and behavior to improve learning (Artino, 2007).

The desire to increase motivation is a central driving force behind most of the techniques discussed in the semi-informal online learning community model. Providing external motivation should be considered throughout the development of the community. Determining if the techniques used will increase or inhibit motivation is important to consider. Additionally, providing support for student self-regulation and internal motivation is vitally important. At times, externally motivating factors can directly influence internal motivation. For example, the INSPIRE leaderboard was provided as a way to encourage students' motivation to participate more and, for many individuals, this motivation increased their own personal drive to be the best, igniting their internal motivation to succeed.

While external motivation is difficult to create and sustain, and internal motivation is impossible to predict, it is necessary to keep motivation as an influencing factor in mind throughout the creation and implementation process. Providing avenues for motivation can greatly influence the way in which the community builds and knowledge is developed.

Implications

Findings from this case study and model development have implications in teaching, research and service.

Teaching.

Online learning has become so pervasive in today's society that many instructors, both in P-12 and higher education, frequently find themselves faced with the prospect of teaching or developing online instructional materials, courses and communities. Many educators must rely on their background in formal education, a background that is ill suited for making appropriate decisions within an online environment. Additionally, many educators are told that community building is a necessary component to successful online education but what it really means to create a community and having a process for doing that is not easy to come by. To many educators, the concept of community is informal in nature, resulting in a disconnect between what they want to create, what they are asked to create, and what they end up creating for online education. Understanding mitigating factors of what makes an online course or online learning community successful, whether formal or informal in nature, is necessary to ensure the success of the online education endeavor.

This model can provide a basis for educator's who are in need of creating an online learning community like INSPIRE. By using this model, educators will be able to evaluate their purpose for creating an OLC and use the model to help make decisions about techniques and components that are necessary for making a semi-informal online learning community successful.

Research.

There are also implications in research. The current literature seems to be categorized into informal education and formal education as if these occur separately. Even the literature in online learning communities attempts to separate the techniques associated with online education from those found in formal and informal educational settings. The findings of this study show that while these techniques can be used separately, a combination of techniques in the appropriate situations can be more beneficial to the project overall.

While models for online learning communities and informal learning exist, there is a lack within the literature for identifying and creating a semi-informal online learning community. This model bridges that gap, providing a framework for future researchers and educators to use when developing an online learning community in which community and knowledge development are of equal weight and purpose.

Service.

There are implications within service as well. Many educational technology professionals work as consultants for a variety of different projects. Frequently these individuals are asked to consult on the development of a project such as an online learning community. Use of the semi-informal online learning community model will help provide a framework for the consultant. The model will also assist in keeping the decision making process from being arbitrary, allowing informed decisions to be made.

Recommendations

Recommendations for future research are important to note as well. This model, while based on both theory and practice, has yet to be formally evaluated. It would be beneficial to apply this particular model to a different online learning community other than INSPIRE to determine the applicability of the model. Also, it would be of interest to see how successful this model is when creating an online learning community from the beginning stages and comparing that to the benefits to applying this model post-development. This could help in determining at what stages this model is of particular use or if it can be implemented at any stage of development or in an already existing online learning community.

The results of this study are of particular interest in that while the literature may try to separate informal and formal techniques, use of both is both necessary and successful in real-world situations. Future research could examine other current online learning communities to see what aspects within them are both informal and formal for a comparison to the results of this case study and for further refinement of semi-informal environments.

Summary

The purpose of this study was to develop a model for informal online learning communities. This purpose was developed under the assumption that the INSPIRE project is a successful informal online learning community in practice. A case study was undertaken to determine how the INSPIRE project models informal online learning and how that model compares to current research. Through this case study, it became apparent that, while all aspects of informal learning and online education are present, there were many factors that have led to the success of the project that do not fit into

current informal or online learning community models. The results of the study showed that many aspects of formal education are not only present, but necessary components to creating a successful online learning community where both knowledge development and community building are desired equally.

The resulting semi-informal online learning community model was developed based on the findings from the case study and data analysis. A semi-informal online learning community uses informal, formal and online education techniques to develop community and knowledge equally and concurrently. By including aspects of community building, a variety of activities and experiences, creating a userfriendly environment, and allowing the community to evolve over time, a successful semi-informal online learning community can be created and maintained using current research and successful real-world experiences.

Future research will continue to add to the body of knowledge contained in this research study, furthering enhancing and illuminating the various aspects of semi-informal online learning communities. Additional knowledge about semi-informal online learning communities can help to create new and better educational opportunities for students and educators regardless of location or background.

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APPENDIX A:

SAMPLE DOCUMENT SUMMARY FORM

Document Title: _____

Document #: _____

Date Collected: _____

Date Coded: _____

Description of document:

Significance or importance of Document:

Brief Summary of Contents:

Codes associated with Document:

APPENDIX B:

SAMPLE INTERVIEW QUESTIONS

1. Describe the INSPIRE Online Learning Community

2. Describe your role within the project.

    a. Probes: decisions made regarding content and decisions made regarding

        development

3. How would you define informal learning?

4. How does INSPIRE model informal online learning?

Additional Questions for Principle Investigator and Assistant Principle Investigator

1. What were the initial plans for informal online learning within this community?

2. How has the INSPIRE Online Learning Community developed over time?

Additional Questions for Education Specialists

1. How have the education specialists planned for informal learning within the

    INSPIRE Online Learning Community?

2. What content or areas within the OLC demonstrate informal learning in an online

    learning community?

Additional Questions for External Evaluators

1. How have the goals for the OLC changed since its initial start?

Additional Questions for the Activity Developers

1. What role do the activities play within the OLC?

2. Describe the activity development process.

3. How do the activities, specifically, influence the informal online learning model?

APPENDIX C:

IRB APPROVAL

Oklahoma State University Institutional Review Board

Date: Friday, February 11, 2011

IRB Application No   ED1118

Proposal Title: Modeling Informal Learning in an Online Learning Community

Reviewed and   Exempt
Processed as:

Status Recommended by Reviewer(s): **Approved**   Protocol Expires: **2/10/2012**

Principal
Investigator(s):

Amanda Glasgow   Susan Stansberry
312 Cordell North   207 Willard
Stillwater, OK 74078   Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

VITA

Amanda Glasgow Keesee

Candidate for the Degree of

Doctor of Philosophy

Thesis: A MODEL FOR SEMI-INFORMAL ONLINE LEARNING COMMUNITIES:
A CASE STUDY OF THE NASA INSPIRE PROJECT

Major Field: Professional Education Studies, Specialization in Literacy and Technology

Biographical:

    Education:

    Completed the requirements for the Doctor of Philosophy in Professional
    Education Studies, Specialization in Literacy and Technology at Oklahoma
    State University, Stillwater, Oklahoma in July, 2011.

    Completed the requirements for the Master of Science in Educational
    Technology at Oklahoma State University, Stillwater, Oklahoma in 2008.

    Completed the requirements for the Bachelor of Science in Athletic Training at
    Oklahoma State University, Stillwater, Oklahoma in 2006.

    Experience:

    INSPIRE Online Learning Community Administrator, NASA Education
            Projects, August 2008-Present, Oklahoma State University
    Teaching Assistant, Educational Technology, August 2008 – Present, Oklahoma
            State University
    Adjunct Professor, Athletic Training Education Program, August 2008-May
            2009, Oklahoma State University
    Graduate Assistant, Athletic Training Education Program, May 2006-August
            2008, Oklahoma State University

    Memberships:

    OSU Educational Media and Technology Student Association
    Golden Key International Society
    Phi Kappa Phi Honor Society Member
    National Athletic Trainers Association
    Oklahoma Athletic Trainers Association

Name: Amanda Glasgow Keesee   Date of Degree: July, 2011

Institution: Oklahoma State University   Location: Stillwater, Oklahoma

Title of Study: A MODEL FOR SEMI-INFORMAL ONLINE LEARNING
              COMMUNITIES: A CASE STUDY OF THE NASA INSPIRE PROJECT

Pages in Study: 240   Candidate for the Degree of Doctor of Philosophy

Major Field: Professional Education Studies, Specialization in Literacy and Technology

Scope and Method of Study: The purpose of this study was to develop a model of
informal online learning communities based on theory, research and practice. Case study
methodology was used to examine the NASA Interdisciplinary National Science Project
Incorporating Research and Education Experience (INSPIRE) Project as an example of a
successful informal online learning community. The case study examined how the
INSPIRE project models informal online learning and how that model compares to
current research in informal and online learning community education.

Findings and Conclusions: This case study revealed that, while all aspects of informal
learning and online education are present within the INSPIRE project, there were many
factors that have led to the success of the project that do not fit into current informal or
online learning community models. Many aspects of formal education are not only
present, but necessary components to the success of the INSPIRE OLC where both
knowledge development and community building are desired equally.

A model for semi-informal online learning communities was developed based on the
findings from the case study. A semi-informal online learning community uses informal,
formal and online education characteristics to develop community and knowledge equally
and concurrently. By including aspects of community building, a variety of activities and
experiences, creating a userfriendly environment, and allowing the community to evolve
over time, a successful semi-informal online learning community can be created and
maintained using current research and successful real-world experiences.

ADVISER'S APPROVAL: Dr. Susan Stansberry