Adventure Learning: Motivating Students in a Minnesota Middle School

Daniel C. Moos
Gustavus Adolphus College

Brian Honkomp
Clearwater Middle School

Abstract

Adventure learning has emerged as a promising technology forum that provides students with opportunities to explore real-world issues through authentic learning experiences. Despite these promises, Adventure learning has received little empirical attention. This study examined how adventure learning affects motivation and learning outcomes with middle school students. As one of their teachers climbed Mt. Kilimanjaro in Africa, 182 seventh and eighth graders learned about social studies. This exploratory mixed-method study utilized the Motivation Strategies for Learning Questionnaire (MSLQ) and an African-knowledge-based questionnaire for quantitative data. Additionally, the researchers collected qualitative data in the form of a semi-structured interview. These data revealed two themes: positive feedback on technology in the classroom and a strong effect of adventure learning on student motivation. (Keywords: Adventure learning, motivation, mixed methods, Motivation Strategies for Learning Questionnaire, MSLQ, Self-Determination Theory)

The study of motivating students in academic setting has long been of interest to the field of educational psychology. Teachers at all levels, from elementary to postsecondary classrooms, have identified concerns related to increasing student engagement and learning (Linnenbrink & Pintrich, 2003). Generally speaking, motivation has been defined as physiological processes involved in the direction, vigor, and persistence of behavior (Eccles, Wigfield, & Schiefele, 1998; Wigfield & Eccles, 2002). This operational definition has grounded theoretical research in the field of academic motivation and has given rise to various theories driven by different intellectual traditions (Weiner, 1992). These perspectives have provided the framework for distinct theoretical approaches to explaining motivation in the classroom, which can include focusing on beliefs, values, and goals (Wigfield & Eccles, 2002). In turn, research guided by these principles has produced theoretical approaches to instructional decisions and principled practices in the classroom. One such approach is inquiry learning, an area that has received considerable empirical and theoretical attention, particularly with respect to its effect on student learning and motivation.

Inquiry Learning

Years ago, an effective teacher would have been thought of as an authority figure who is committed to transmitting a standardized interpretation of information. However, this "instructivist" approach to structuring a classroom has evolved, as evidenced by the emergence of inquiry learning. Rather than focusing on the rote memorization of instructional material, inquiry learning emphasizes active learning and development of analytical skills as opposed to rote memorization (Bruner, 1961). Inquiry learning encompasses a range of pedagogical approaches and philosophies, but there are some core instructional implications. A primary assumption is that inquiry learning requires the teacher to support the students' process of discovering knowledge, as opposed to directly providing knowledge. This pedagogical approach has been influential in science education, as this domain lends itself well to open-ended questions and active learning. Empirical research has documented the potential benefit of this approach (e. g., Greeno, Collins, & Resnik, 1996) and has resulted in an increased emphasis on inquiry learning within science classrooms (e. g., Linn, diSessa, Pea, & Songer, 1994). The growing support for this approach is grounded in the argument that the inherent nature of this domain is consistent with the core assumptions and pedagogical implications of inquiry learning. Learning in the domain of science essentially calls for an open-ended, active, and question-driven process, which is a natural fit for inquiry learning. Beyond the alignment between this domain and the instructional implications of this approach, it has also been suggested that inquiry learning can have a positive effect on student motivation. These effects are particularly strong if inquiry learning is embedded in authentic settings (Edelson, Gordin, & Pea, 1999).

Supporting Inquiry Learning through Adventure Learning

The latest advancements in the field of educational and instructional technology offer exciting forums to support forms of inquiry through learning in authentic settings. Some of these latest environments include hybrid online education, distance learning, remote education, and adventure learning (AL). According to Swan and Brehmer (1994), "Distance learning is characterized by the use of technology to link instructors and learners who are physically apart from one another" (p. 13). Distance education often is associated with teachers offering a variety of classes that are transmitted to rural areas. A modification of distance learning is adventure learning, which has been described as "a hybrid distance education approach that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative learning environments" (Doering, 2006, p. 197). A variety of AL websites have emerged, including Blue Zones (http://www.bluezones.com), the Jason Project (http://www.jason.org), Quest Series (http://www.quest.com), Journey North (http://www.learner.org/north), Reach the World (http://www.reachtheworld.org), GlobaLearn

(http://www.globalearn.org), and TerraQuest (http://www.terra-quest.com) (Doering & Veletsianos, 2008).

Although these websites represent distinct learning domains and approaches to AL, several guiding principles for the design of AL environments have been identified (see Doering, 2006). First, these environments need to align with curriculum and be grounded in problem solving, a guiding principle that is consistent with inquiry learning. Furthermore, this alignment should be contextualized in authentic, real-world problem-solving tasks, an approach consistent with the vision of John Dewey and inquiry learning. Considered the founding father of progressive education, Dewey believed that education should be situated in real-world experiences and activities that center on the real lives of the students (Dewey, 1938). This vision of education supports the very nature of AL environments. In reference to the AL environment GoNorth!, Doering and Veletsianos (2008) noted that, "In AL programs, students are faced with real-world problems while they identify and pose questions, analyze data, interact and collaborate with colleagues and experts, and take action within their own community" (p. 25).

Another guiding principle is that the design of these environments should offer opportunities for collaboration, which can be achieved by interactions between students, teachers, field experts, and subject-matter experts. Communication among a diverse group of individuals not only promotes learning through "distributed cognition" (Bransford, Brown, & Cocking, 1999; Vye et al., 1998), but it also provides opportunities for students to develop skills important for life outside of school. Namely, communication among a diverse group of individuals promotes social negotiation and transformative learning (Doering, 2006). Students engaged in such communication can become "…critically aware of one's tacit assumptions and expectations and those of others and assessing their relevance for making an interpretation" (Mezirow, 2000, p. 4). Use of the Internet in the design of AL facilitates these communications and engagement in learning. Using the Internet to facilitate communication allows for collaboration that extends beyond the walls of the classroom.

Adventure Learning: Context for this Study

Christian Gilbert, an eighth grade geography teacher at a suburban middle school, was the lead in this AL trip. This AL experience occurred August 5–24, 2009, during which Christian Gilbert spent three days on a service project related to orphans, two days on Safari, and seven days climbing Mt. Kilimanjaro. Gilbert created a sense of relatedness and autonomy each day he e-mailed his students a daily lesson. These daily e-mails included a "lesson of the day," latitude and longitude coordinates of his position linked to Google Maps, a spotlighted "animal of the day," and an audio update recorded using a satellite phone. This teacher provided his own financial support for the trip and estimates the cost of equipment and logistics at $6,500.

The equipment he used for the AL was a Satellite Pour l'Observation de la Terre (SPOT) satellite transponder, digital still and video cameras, and a satellite phone. SPOT is a satellite GPS messenger system that provides location-based communication as well as predefined e-mails and SMS alerts. This equipment allowed for the creation of an AL environment that contained content aligned to Minnesota's seventh and eighth grade geography and earth science state standards. After returning from the trip, Gilbert posted all of the lessons, pictures, and videos to the website Go4thesummit.com, a site dedicated to documenting the AL expeditions that strives to provide students with unique opportunities to learn about outdoor experiences.

Theoretical Framework: Explaining Motivation in Adventure Learning

A primary goal for this study was to examine the effect of AL on student motivation. The field of academic motivation has evolved over the years, in part due to the robust body of empirical work. This research has given rise to a myriad of theoretical frameworks that attempt to describe the phenomena of student motivation. As noted in a number of literature reviews (see Murphy & Alexander, 2000, for an overview), researchers need to clearly articulate the theoretical framework guiding their research on student motivation. To that end, the Self-Determination Theory (SDT) may be the most natural fit for explaining student motivation while using AL environments. This theory is one of the more prominent theories in this field due to its comprehensive explanation of the interrelated variables affecting motivation in the classroom. This theory has been used to examine "the degree to which human behaviors are autonomous or self-determined, as well as the personal and contextual factors that determine personal self-determination" (Deci & Ryan, 1985, p. 41). The foundation of this theory relates to the three basic needs that motivate students: autonomy, competence, and relatedness (Deci & Ryan, 2008). Satisfaction of the three basic needs provides the necessary conditions that allow people the freedom to engage in a self-determination activity.

The first student need is autonomy, which refers to the degree of choice that students have about tasks and when and how to perform them (Pintrich & Schunk, 1996). Brophy (2004) inferred that students experience autonomy when their input is valued and encouraged. In an autonomy-supported classroom, the environment is one that facilitates independent thought and an understanding that there are many ways to solve a problem. Teachers in autonomy-supportive classrooms encourage students to solve problems in their own ways (Valas & Solvik, 1993). They promote student initiative for asking questions, provide ideas for individual learning projects, and emphasize activities that students find interesting and enjoyable so that they engage in them without extrinsic motivation. Brophy (2004) suggests that creating opportunities for choice supports autonomy and encourages students. The students' choices are guided by interest, and this

promotes ownership. Feelings of self-determination are enhanced when there is support for selecting and planning activities (Ames, 1992). The inherent design features of AL promote feelings of autonomy, as this environment utilizes the Internet for curriculum development. Interlinked nodes of information (i.e., hyperlinks) are an inherent design structure of the Internet, and hyperlinks allow students to decide which node of information to access during the learning process (Scheiter & Gerjets, 2007). This freedom to make navigational choices during learning with technology may facilitate feelings of autonomy (Moos & Marroquin, 2010).

The second component of the SDT focuses on competence needs, which are met when students can effectively deal with the environment and master and control things around them (Brophy, 2004). Making sure that learning activities are well matched to the current level of the students' knowledge and skill needs can support students' competence. The task should be challenging enough to extend learning but not so difficult to cause frustration or confuse the student (Brophy, 2004). When appropriately designed, AL environments include problem-solving tasks, learning outcomes, and scaffolding that are consistent with the demographic of those using these environments. In other words, the AL environment appropriately matches the knowledge and skills needs of the students. This alignment can facilitate students' feelings of competence because the curriculum is situated in an authentic environment.

The third component of SDT is relatedness, which concerns the need of belonging or feeling attached to a group. Forming and maintaining healthy relationships ideally meets the need of relatedness. The desire for affiliation reflects a need for attachment to others, paralleling the need for relatedness (Deci & Ryan, 2008). Allowing students to collaborate and interact with peers in the classroom can satisfy this component of the motivation. When classrooms promote a climate of collaboration, students are likely to experience enhanced intrinsic motivation while they participate in learning activities that allow them to positively interact with their classmates. Furthermore, students can experience relatedness if they have opportunities to collaborate with each other and their teacher. AL environments have the potential for students to uniquely feel a sense of relatedness. These environments often offer opportunities for collaboration, which can be achieved by interactions between students, teachers, field experts, and subject-matter experts via the technology embedded in the AL. Communication among a diverse group of individuals promotes social negotiation and transformative learning (Doering, 2006). Students engaged in such communication can become "…critically aware of one's tacit assumptions and expectations and those of others and assessing their relevance for making an interpretation" (Mezirow, 2000, p. 4). Furthermore, AL environments have the potential to create feelings of relatedness through students interacting with their teacher in an authentic setting.

Figure 1: Homepage in AL environment.

Current Study and Research Questions

The outlined principles guiding the design of AL provide theoretical evidence that these environments should motivate students and promote deep, conceptual learning. In particular, these design principles align with the core components of the SDT. Providing students with opportunities to explore real-world issues through collaborative learning environments (i.e., adventure learning) should promote their feelings of competence, relatedness, and autonomy. However, these tantalizing promises of AL have been largely theoretical in nature, as very little empirical data has been collected with these environments. The purpose of this study is to add to the theoretical and empirical body of knowledge as it relates to AL environments, motivation, and student learning. The questions guiding the design and implementation of this study were:

- To what extent does adventure learning enhance learning in the area of social studies?
- To what extent does adventure learning enhance motivation as it relates to learning in the area of social studies?
- To what extent does the SDT explain students' perceptions of adventure learning?

Method

Participants

The researchers chose Clearwater Middle School, located in Waconia, Minnesota, as the site of this study because the designer of the AL environment teaches at this school. This school has a total of 48 teachers and 873 students in grades 5–8. The student demographics are comprised of 810 Caucasian, 26

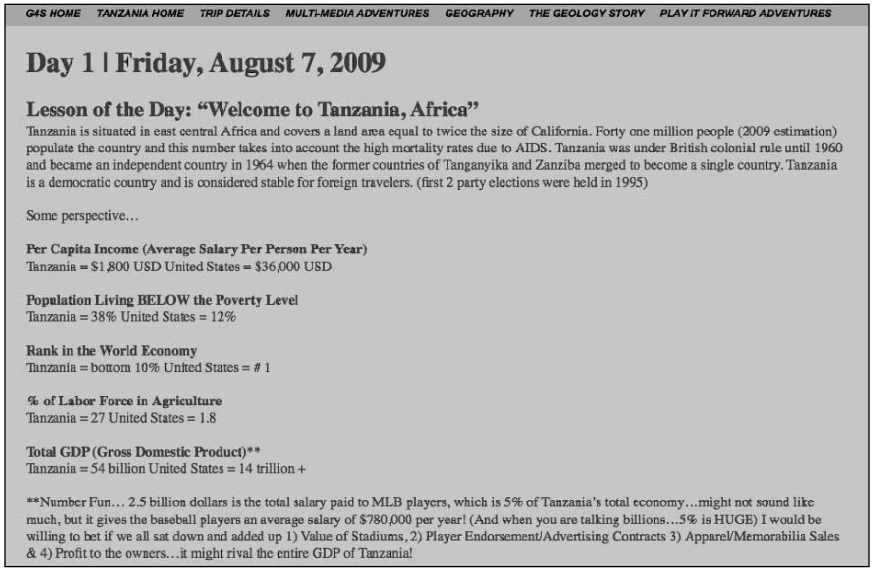

Figure 2: First lesson in AL environment.

Latino/a, 18 Asian, 16 African-American, and 3 American Indian students. Participants for this study included seventh and eighth graders. These students were chosen because the content in the AL used for this study aligned to Minnesota's seventh and eighth grade geography and earth science state standards.

Participants included 182 seventh and eighth grade students from the suburban Minnesota middle school. Of the total participants, 111 (61%) were female and 87 (39%) were male. This sample included 82 (45%) seventh graders and 116 (55%) eighth graders. Participants in the qualitative analysis included 3 seventh grade students (2 female and 1 male) and 8 eighth grade students (4 females and 4 males). These students represented a convenient sample because they volunteered to participate in the interviews and were available at the time of the study (Fraenkel & Wallen, 2006).

Adventure Learning Environment

Teachers at a suburban Minnesota middle school middle school designed the AL environment used for this study. Their adventure learning started in the winter of 2009, when they climbed Aconcagua, a mountain located in Argentina. The teachers used technology to provide students with authentic learning experiences related to this climb. During their expedition, these educators brought a SPOT satellite, wrote lessons, and e-mailed the information to students at their middle school. One of the leaders of the expedition (who is also a teacher at the suburban middle school) said, "The greatest accomplishment of climbing this mountain is to see how excited and motivated the students are about learning about science and geography while we are climbing" (personal communication, C. Gilbert, 2009). In the summer of

2009, this same teacher climbed Mt. Kilimanjaro in Africa. The AL for this study came from this experience. This AL environment, which included e-mailed GPS coordinates, PDF lessons about Africa, and podcasts via satellite phone, provided students with an opportunity to follow his adventures and experience geography lessons in an authentic context. See Figures 1 and 2 for screen shots of the adventure learning environment used in this study.

Measures

This study used quantitative measures, including the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991) and a pretest/posttest measure, as well as a qualitative measure (semi-structured interviews), to examine how adventure learning affects seventh and eighth grade student learning. As such, this study used an exploratory mixed-method design (Fraenkel & Wallen, 2006) guided by the rationale that "the use of multiple data-collection methods contributes to the trustworthiness of the data" (Glesne, 2006, p. 36).

Quantitative measures. The researchers used the MSLQ to measure how adventure learning affected the participants' motivation. This self-report questionnaire includes 81 items the students answered on a 7-point Likert scale (1 = not at all true of me, 7 = very true of me), and these 81 items fall into nine subscales. Given the scope of this study, the following five motivation subscales were used: intrinsic motivation (four questions), extrinsic motivation (four questions), task value (six questions), self-efficacy (eight questions), and control beliefs (four questions). Previous research using the MSLQ has reported Cronbach's alpha ranging from .52 to .93 for the items. In addition, confirmatory factor analysis in previous research has demonstrated reasonable factor validity for each scale (e.g., Pintrich, 1993; Rao & Sachs, 1999).

To measure students' learning, the researchers administered a pretest and a posttest (see Appendix A, p. XX). Geography and science teachers from this Minnesota middle school collaboratively wrote these two tests ("The African content test"). The test aligned with the topics that they covered while one of the teachers was on the African adventure learning trip. These topics included flora, fauna, political geography, and geology of Africa. This test had 16 multiple-choice questions, and students had to choose the correct answer from four different choices. The students took the same pretest and posttest before and after the African adventure learning trip.

Qualitative measures. A qualitative approach can provide another view and different perspective on the problem (Merriam, 1998), which complements quantitative research. This study utilized semi-structured interviews as a way to complement the quantitative data gathered from the MSLQ. The researchers interviewed a total of 20 participants. The interviews, which one of the two researchers individually conducted in a classroom at Clearwater Middle School, were tape-recorded and lasted 20 minutes on average. The

interviews were later transcribed and used for the qualitative analysis. Participants in the interview shared words, thoughts, and phrases (indicators). Glaser (1978) referred to this as "the concept-indictor model" (p. 62-63). The "concept-indicator model" (Glaser, 1978) was the guiding framework for the study design and analysis of the qualitative data. A core assumption of this theoretically driven approach is that theory and data should be in constant comparison, an approach that lends itself to conceptual emergence. In the case of this study, the words, thoughts, and phrases that the participants provided during the interview served as "indicators" to provide the groundwork for conceptual emergence.

The specific constructs identified in the MSLQ guided the following seven questions for the semi-structured interview:

- Let's start by discussing your general impressions of learning about Africa remotely. What did you think about this experience?
- Was learning about Africa remotely different than the way you have learned about other social studies/geography topics? If so, how?
- Has learning about Africa remotely affected your interest in learning about social studies/geography in the future? If so, how?
- Has learning about Africa remotely affected your interest in technology, particularly with technology in the classroom? If so, how?
- How confident were you that you could get a good grade? Why do you believe this?
- How important was it for you to get a good grade? Why do you believe this?
- Has your interest in Africa and/or social studies/geography increased since learning about Africa remotely? Why do you believe this?

Procedure

The experimental procedure involved three sessions. During the first session, conducted on May 15, 2009, students were told that one of their geography teachers would be going to Africa on a safari and climbing Mt. Kilimanjaro. They were also informed that they would have an opportunity to follow along and learn with their teacher while he was on the trip by receiving e-mailed GPS coordinates, PDF lessons about Africa, and podcasts via satellite phone (i.e., "adventure learning"). The seventh and eighth grade students were then given the MSLQ and pre-Africa content test. While administering the tests, students were made aware that their grades would not be affected by any of the results. The second session, conducted on August 20, 2009, included a group of students who were randomly called and selected due to availability. These students were invited to come to the middle school and discuss their feelings about the adventure learning experience. The final session, conducted September 4, 2009, included handing out and collecting the MSLQ and post-African content test.

Results

Quantitative analyses. The average overall mean for the motivation 26 questions on the MSLQ was relatively high before students started the AL experience (M = 5.79, SD = 1.05). A paired t-test indicated that the students' overall motivation significantly increased following the use of AL (M = 5.83, SD = 1.07), $t(181) = -1.45$, $p < .01$. Separate paired tests also indicated significant increases in the following motivation subscales: Control Beliefs (M = 5.02, SD = 2.34), $t(181) = -3.46$, $p = .001$, Self-Efficacy (M = 5.64, SD = 2.34), $t(181) = -2.15$, $p = .05$, and Task Value (M = 5.04, SD = 2.34), $t(181) = -2.05$, $p = .05$. Intrinsic motivation and extrinsic motivation did not significantly increase ($p > .05$). See Table 1 for mean (and standard deviations) of the individual motivation subscales. A separate paired *t*-test also revealed significance differences in the pretest and post Africa basic knowledge test (M = 7.42, SD = 2.74), $t(181) = -9.71$, $p < .01$. See Table 2 for mean (and standard deviations) for the pretest and posttest scores.

Qualitative analysis. The qualitative analysis was drawn from the words and phrases uttered during the semi-structured interviews. Analysis of these phrases resulted in the emergence of the following key, emergent themes: (a) The role of technology in the classroom, and (b) students' motivation with AL can be best explained by the Self-Determination Theory. With respect to the first theme, it was evident that many students felt that they understood lessons better from the use of technology in the classroom. The affinity to technology was often connected with the concept of the "digital native;" that is, the students noted that digital technologies were an expected component of their life. The below excerpts represent this concept and highlight the students' conception of technology in the classroom in comparison to more traditional classroom activities.

> But having everything online—everyone knows about the internet and everyone uses the internet, so it was really easy to just go home and click a button and go on his website. (Participant #1)

> …because reading and stuff makes people bored ... learning about different stuff on the internet…. We're all just used to using that here. (Participant #2)

> I like it more on the computer because I'm used to reading stuff on that and I don't like the books at all. (Participant #3)

Many students interviewed also discussed why they believe AL was more effective than textbooks.

> It was a lot easier to learn because everyone was learning with you and you could all talk about it, instead of coming in here, reading a textbook. (Participant #1)

Table 1: Mean and Standard Deviation of the MSLQ Pretest and Posttest

	Pretest		Posttest	
MSLQ subset	M	SD	M	SD
Self-Efficacy	4.48	0.96	5.44	1.09
Control Beliefs	5.18	1.01	5.44	0.96
Task Value	4.85	1.12	5.03	1.13
Intrinsic	4.79	1.09	4.94	1.06
Extrinsic	5.29	1.07	5.26	1.17

Table 2. Mean and Standard Deviation of the Africa Content Pretest and Posttest

	Pretest		Posttest	
	M	SD	M	SD
Africa Content Test	7.64	2.40	10.71	2.70

> We're used to teaching out of textbooks and this is teaching real stuff that they've been through. It's cooler and easier to interact with it … I think it's a really good idea to improve our learning … it helps our learning level and we need that because we have fancy computers now. (Participant #2)

> … because books just get boring. Because I'm always like "Oh my God, this book is long, it's like this thick" or something. And when you go on the computer, you can't really see how long it is, unless you go like all the way down, which I don't have the patience to do that either, so if I just like start at the beginning, I always get annoyed when I start a book and don't finish it, 'cuz I want to finish it. But on the computer I don't have to the need to finish it … There just like annoying [books] and there is like no picture and when you go on the Internet you can take pictures off the Internet or take pictures and put them on there. But like in a book every other kid might be learning from the same book. (Participant #3)

> Just being actually out there in the field and its current and up to date. You can't wonder if it's outdated or anything because it's that day. (Participant #4)

> I think it is more accurate [information in the internet] (Participant #5)

> Yeah, I would rather listen to people talk about it than reading. (Participant #6)

The second theme that emerged from the qualitative analysis is that the positive effect of AL on student motivation can be explained by the SDT, which suggests that students are motivated if they feel competent, have a sense of relatedness, and autonomy. This first set of excerpts represents students' sense of relatedness with AL.

… I like how he used his experiences and it's like someone I know and it's their personal and not just some author from a book. They might be a great author but they don't like, little joke that will make everyone laugh in it (Participant #3)

Well number one, I know [teacher], so it's interesting to know where he is … textbooks, just reading, isn't as fun, and when it's someone else's experiences you have no idea who they are, or if they're even real. (Participant #4)

Textbook, reading, I guess. Sometimes you read over it, and you don't think twice about what you read. Or, just skip it sometimes. Yeah, it's [adventure learning] is different because you know he's there, and he wants you to learn this stuff. (Participant #5)

I think it's like, how he's actually there, and there first-hand and telling you about it actually through voice…I was more into it [in reference to listening to [teacher's] voice. (Participant #7)

… because it is coming from him when he is there and it's not him having to remember everything and he's saying it while he's there. (Participant #8)

Because I don't like reading it in class, you just sit there and read and I guess it's cool to that he writes stuff with his own personality so it's interesting instead of just a text book. It's more interesting when you have someone writing it with personality. (Participant #9)

The interviews also revealed that students felt a sense of competence during AL, an important component of SDT.

I actually remember something for once. (Participant #1)

Yeah, I learned a lot compared to … it's cooler and easier to interact with it. I think it's going to help a lot because you can see what he's talking about and its way more clear. You can understand it a lot better. (Participant #2)

And a lot of the stuff he talked about in AIDS in one of the things we learn about in school so that was interesting to relearn; to remember some of it. (Participant #4)

I thought it was pretty fun, and you learn a lot more … I thought it did [help me learn], because you got to do it. (Participant #7)

Yeah. I feel like I'm learning more than I would if I was sitting there reading a textbook because I often get distracted if I'm reading a textbook. (Participant #9)

Last, evidence of intrinsic motivation was also found in throughout these interviews. As noted by Brophy (2004), environments that foster students' relatedness needs, engage the learner, and foster a sense of competence that will ultimately promote intrinsic motivation. Presented below are some students' thoughts on intrinsic motivation as it related to their AL experience:

> … but, I think it's just that it is like, you don't have to do it, it's more like wanting to, and then learning about something really cool that you didn't think you would normally remember in school, out of the textbook … (Participant #1)

> Yeah, it kind of made me want to try it a little more … I'd kind of like to go to Africa. Like, the Mount Kilimanjaro area. (Participant #7)

> … it's just cooler to get it while he's there because it seems like even though you would still have the same information, it's just more interesting to get it while he's there ... it makes it more real … I think mostly just knowing that he's there and that he's saying the stuff while he's there and seeing it, makes it more real and more fun to know he's doing it right now. (Participant #8)

> I think it is a lot more interesting and exciting, because usually teaching is boring…It was more exciting because of the computers and GPS and stuff instead of regular textbooks … Like [teacher's] website, all the assignments and stuff are on there [that made it easier] because you knew what was coming up, like quizzes and stuff, so you could study for them … I like [teacher] and remote learning because it's more interesting and exciting and I wish other teachers would do it, too. (Participant #10)

Discussion

Results from this study shed light on the motivational and cognitive benefits of integrating AL into the curriculum. In terms of cognitive effects, results indicated that the participants significantly improved their score from the pretest to posttest after using this AL environment. Although a myriad of variables may explain this demonstrated learning, the qualitative data from the semi-structured interviews suggest that AL positively affected their motivation, which in turn facilitated learning. Using the open-ended coding process, two main themes emerged in the qualitative data: (a) views on technology in the classroom and (b) alignment with the SDT.

Views on Technology in the Classroom

In terms of the first theme, the students expressed definitive views on the role of technology in the classroom. Several students indicated that the Internet, which was used in the AL environment for this study, is a digital media that is a comfortable and expected part of their lives. Comments such as "Everyone uses the Internet," and "I don't like the books at all," revealed

an assumption about the ubiquitous nature of technology. Furthermore, student comments also revealed an assumption that information in textbooks is inherently outdated, whereas the Internet presents accurate and current information. These middle school students seemingly believe that the Internet is inherently a more effective pedagogical tool than the more traditional approach of textbooks.

To understand the context of the views, it is important to consider the categorization of these students as "digital natives," a term used to describe students born after 1980 (Prensky, 2001). Presumably, students in developed nations have been exposed to digital media to a much greater degree than those from any other previous generation (Guo, Dobson, & Petrina, 2008). According to Pensky (2001):

Today's average college grads have spent less than 5,000 hours of their lives reading, but over 10,000 hours playing video games (not to mention 20,000 hours watching TV). Computer games, e-mails, the Internet, cell phones and instant messaging are integral parts of their lives. (p. 1)

It has been asserted that this type of interaction with digital media has led to certain expectations and competencies for "digital natives," such as the ability to process parallel information and complete multiple tasks simultaneously (Pensky, 2001). Despite these claims, more recent research has questioned whether these students have developed the necessary skills and critical understanding to effectively use digital media (Guo, Dobson, & Petrina, 2008). Research guided by the Cognitive Load Theory (e.g., Gerjets, Scheiter, & Catrambone, 2004; Kester, Kirschner, & van Merriënboer, 2005; Mayer & Moreno, 2003; Paas & van Merriënboer, 1994; Sweller, 1988, 1994; van Merriënboer & Ayres, 2005) and the Self-regulated Learning Theory (e.g., Azevedo, 2009; Azevedo, Cromley, & Seibert, 2004; Azevedo & Witherspoon, 2009; Greene & Azevedo, 2009; Moos, 2009, 2010; Moos & Azevedo, 2006; Moos & Azevedo, 2006, 2008a, 2008b, 2008c, 2009) has empirically documented the challenges digital natives can face when learning with various digital media, such as multimedia and hypermedia. However, it has been suggested that digital natives may have certain expectations with respect to learning with technology, regardless of their skill with these environments. This study provides some qualitative evidence that digital natives may form specific expectations concerning technology, particularly in terms of its relative effectiveness and accuracy when compared to the more traditional textbook. However, it should be noted that this explanation is not suggesting that technology implementation, or lack thereof, is a direct function of the generational gap.

Alignment with the Self-Determination Theory

These expectations may be an affective reaction to the relatively unique design features of digital media, such as AL. As demonstrated in the qualitative portion of this study, the effect of AL on motivation aligns with the core

assumptions of the SDT. While students in this study routinely made comments that reflected a sense of competence (i.e., "I thought it was pretty fun, and you learn a lot more") and autonomy (i.e., ""I thought it did [help me learn], because you got to do it"), the majority of comments were in reference to the sense of relatedness associated with AL (i.e., "I like how he used his experiences and it's like someone I know and it's … not just some author from a book"). These comments reflect that AL may be particularly powerful in creating feelings of relatedness for students. However, these comments also reveal that these affective reactions are not inherent to this technology environment. In other words, it may not be AL, per se, that is creating the feeling of relatedness. Rather, it is the familiarity of the teacher involved in AL. Although this technology environment offers students opportunities to explore real-world issues through authentic learning experiences, AL's full potential may be mediated by familiarity between the students and the teacher. This assumption offers an important design implication for AL environments. As noted in the introduction, Doering (2006) has offered important guidelines for designing effective AL environments. However, the relationship between the students and teacher is missing from these implications. Findings from this study suggest that this factor may play an important role in maximizing the motivational benefits of these technology environments. However, this design implication is an assumption, which requires future research to provide a more robust understanding of factors that affect the effectiveness of AL environments.

Future Directions

A promising direction for future research is to empirically isolate the core variables in the SDT. Although this study suggests that AL has a positive effect on students' feelings of competence, autonomy, and relatedness, the extent of these relationships is unknown. How might a group of students who do not know the teacher in this AL environment respond? Would they report similar feelings of relatedness? Furthermore, which of these variables is more strongly predictive of learning in these environments? Addressing these questions will begin to shed light on the complex relationship between theoretically grounded motivation constructs and learning with this technology environment. Additionally, this study collected quantitative data on learning outcomes, but it did not collect process data. Previous research has empirically documented that various learning processes are critical to consider, particularly in technology environments that offer students multiple representations and some degree of autonomy with respect to the instructional path (Azevedo, 2009; Azevedo, Cromley, & Seibert, 2004; Azevedo & Witherspoon, 2009; Greene & Azevedo, 2009; Moos, 2006; Moos & Azevedo, 2008a, 2008b, 2008c, 2009). These lines of research have been able to identify the relationship between learning outcomes and specific types of learning processes, such as strategies, monitoring, and planning. These

lines of research have provided important design implications for technology, particularly environments that provide some form of scaffolding. In a similar vein, research examining AL environments would be well served to empirically examine how students engage in the learning process. Recent technological advances (i.e., log file analyses and eye tracking), as well as those deeply rooted in cognitive psychology (i.e., think-aloud protocols), offer promising methodological approaches to this line of research. Finally, it should be noted that the sample for this group were seventh and eighth graders. While "digital natives" has been broadly defined as any student born after 1980 (Prensky, 2001), there certainly are developmental issues to consider when examining the complexities of cognitive and motivational variables in AL. Future research would be well served to examine AL across developmental groups.

Challenges of Implementing Adventure Learning

Though adventure learning offers exciting possibilities to engage students and facilitate deep, meaningful learning, it is not without substantial challenges and issues to consider. First and foremost, the individual characteristics of students need to be considered. This study suggested that AL offers promises of facilitating a sense of autonomy, relatedness, and competence as outlined by the SDT. However, the individual student goals may represent some challenges with such learning environments. Pintrich and Schuck (1996), among others, suggested that individual, personal goals represent the directing force of activity and thus need to be considered when designing learning environments. Students who are learning-oriented, and thus are driven by the desire to develop their knowledge and skills, may flourish in environments such as AL. This type of computer-supported learning environment allows these students to actively engage in the learning process (Järvelä & Järvenoja, 2004). However, not all students share this learning goal, as some students are not as willing to actively engage in an inquiry-based learning environment and dislike situations that require autonomy (Niemivirta, 1998). Thus, AL may actually increase learning difficulties for these students. A primary challenge for learner-centered, inquiry-based environment such as AL is the diversity of student motivation, particularly for those who do not have learning goals and thus may not be motivated to engage in the inquiry activities.

Another logistical challenge is implementing AL in areas that lack the technology resources to do so. As outlined in the introduction, the AL environment used for this study required a number of financial resources and human capital. This challenge is magnified by the lack of empirical and theoretically driven base of research of AL. There is not a sufficient body of research that conclusively indicates a strong, positive relationship between AL, student learning, and motivation. Thus, although the costs of implementing AL are known to be high, the benefits of AL are still unknown,

given the lack of research in this area. Furthermore, a potential novelty effect needs to be considered with AL. Certainly this approach to learning is novel compared with traditional approaches, and thus the questions remains whether the positive effects can be attributed to its novelty or the actual learning environment. Longitudinal data and a more robust body of research would help address these potential questions.

Limitations

There are several limitations in this study. First, as previously noted, these students represented a convenient sample because they volunteered to participate in the interviews and were available at the time of the study (Fraenkel & Wallen, 2006). Furthermore, only one school in Minnesota was invited to participate in the study, and there was an uneven distribution within this sample. A significantly higher percentage of females participated, a distribution that is not consistent with the Minnesota school. Given the absence of random sampling and uneven gender distribution, the generalizability of the findings is limited. Additionally, the participants continue to attend school with the two teachers that designed the AL environment and thus have close contact with them. As such, there is a potential issue of social desirability with their responses in both the MSLQ and to the questions asked during the semi-structured interview. Lastly, although significant time elapsed between the administration of the pretest and posttest, it should be noted that they were identical, a design format that may affect learning outcomes.

Author Notes

Daniel Moos is an assistant professor in the Department of Education at Gustavus Adolphus College. Daniel received his PhD in educational psychology from the University of Maryland, College Park. His research draws from a variety of fields, including educational technology, educational psychology, and cognitive psychology. Most recently, he has focused on how various technology environments affect student motivation. Please address correspondence to Daniel C. Moos, Gustavus Adolphus College, Department of Education, Mattson Hall, 800 West College Avenue, Saint Peter, Minnesota 56082. E-mail: dmoos@gustavus.edu

Brian Honkomp is a middle school teacher at Clearwater Middle School and is currently finishing a doctorate. He has a keen interest in technology in the classroom and, in particular, the emergence of adventure learning. Please address correspondence to [NEED MAILING ADDRESS AND EMAIL ADDRESS].

References

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*(3), 261–27.

Azevedo, R. (2009). Theoretical, methodological, and analytical challenges in the research on metacognition and self-regulation: A commentary. *Metacognition & Learning, 4*(1), 87–95.

Azevedo, R., & Witherspoon, A. M. (2009). Self-regulated learning with hypermedia. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 319–339). Mahwah, NJ: Routledge.

Azevedo, R., Cromley, J. G., & Seibert, D. (2004). Does adaptive scaffolding facilitate students' ability to regulate their learning with hypermedia? *Contemporary Educational Psychology,* 29, 344–370.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.) (1999). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press.

Brophy, J. (2004). *Motivating students to learn* (2nd ed.). Mahwah, NJ: Erlbaum.

Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review, 31*(1), 21–32.

Deci, E., & Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E., & Ryan, R. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology, 49*, 14–23.

Dewey, J. (1938). *Experience and education.* New York: Collier.

Doering, A. (2006). Adventure learning: Transformative hybrid online education. *Distance Education, 27*(2) 197–215.

Doering, A., & Veletsianos, G. (2008). Hybrid online education: Identifying integration models using adventure learning. *Journal of Research on Technology in Education, 41*(1), 23–41.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In N. Eisenberg (Ed.), *Handbook of child psychology: Volume 3: Social, emotional, and personality development* (5th ed., pp. 1017–1095). New York: Wiley.

Edelson, D. C., Gordin, D. N., & Pea, R. D. (1999). Addressing the challenges of inquiry-based learning through technology and curriculum design. *Journal of the Learning Sciences, 8*(3&4), 391–450.

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education* (6th ed.). Boston: McGraw-Hill.

Gerjets, P., Scheiter, K., & Catrambone, R. (2006). Can learning from molar and modular worked examples be enhanced by providing instructional explanations and prompting self-explanations? *Learning and Instruction, 16*, 104–121.

Glasser, B. G. (1978). *Theoretical sensitivity.* Mill Valley, CA: Sociology Press.

Glesne, C. (2006). *Becoming qualitative researchers: An introduction* (3rd ed.). Boston: Pearson Education, Inc.

Greene, J. A., & Azevedo, R. (2009). A macro-level analysis of SRL processes and their relations to the acquisition of sophisticated mental models. *Contemporary Educational Psychology, 34*, 18–29.

Greeno, J. G., Collins, A. M., & Resnick, L. B. (1996). Cognition and learning. In D. Berliner, & R. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 15–41). New York: MacMillian.

Guo, R. X., Dobson, T., & Petrina, S. (2008). Digital natives, digital immigrants: An analysis of age and ICT competencies in teacher education. *Journal of Educational Computing Research, 38*(3), 235–254.

Järvelä, S., & Järvenoja, H. (2004). Students' motivation in technology-supported environments: Aspects of self-regulation and volition. In M. Wosnitza, A. Frey, & R. S. Jäger (Eds.), *Lernprozess, Lernumgebung und Lerndiagnostik* (pp. 139–149). Landau: Verlag Empirische.

Kester, L., Kirschner, P. A, & van Merriënboer, J. J. G. (2005). The management of cognitive load during complex cognitive skill acquisition by means of computer-simulated problem solving. *British Journal of Educational Psychology, 75*(1), 71–85.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading & Writing Quarterly, 19*(1), 119–137.

Linn, M. C., diSessa, A., Pea R. D., & Songer, N. B. (1994). Can research on science learning and instruction inform standards for science education? *Journal of Science Education and Technology, 3*(1), 7–15.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist, 38*(1), 43–52.

Merriam, S. (1998). *Qualitative research and case study applications in education.* San Francisco, CA: Jossey-Bass Publishers.

Mezirow, J. (2000). *Learning as transformation: Critical perspectives on a theory in progress.* San Francisco: Jossey Bass.

Moos, D. C. (2009). Note-taking while learning with hypermedia: Cognitive and motivational considerations. *Computers in Human Behavior, 25,* 1120–1128.

Moos, D. C. (2010). Self-regulated learning with hypermedia: Too much of a good thing? *Journal of Educational Multimedia and Hypermedia, 19*(1), 59–77.

Moos, D. C., & Azevedo, R. (2006). The role of goal structure in undergraduates' use of self-regulatory variables in two hypermedia learning tasks. *Journal of Educational Multimedia and Hypermedia, 15*(1), 49–86.

Moos, D.C., & Azevedo, R. (2008a). Exploring the fluctuation of motivation and use of self-regulatory processes during learning with hypermedia. *Instructional Science, 36*, 203–231.

Moos, D. C., & Azevedo, R. (2008b). Self-regulated learning with hypermedia: The role of prior domain knowledge. *Contemporary Educational Psychology, 33*, 270–298.

Moos, D. C., & Azevedo, R. (2008c). Monitoring, planning, and self-efficacy during learning with hypermedia: The impact of conceptual scaffolds. *Computers in Human Behavior, 24*(4), 1686–1706.

Moos, D. C., & Azevedo, R. (2009). Self-efficacy and prior domain knowledge: To what extent does monitoring mediate their relationship with hypermedia? *Metacognition and Learning, 4*(3), 197–216.

Moos, D. C., & Marroquin, L. (2010). Multimedia, hypermedia, and hypertext: Motivation considered and reconsidered. *Computers in Human Behavior, 26*, 265–276.

Murphy, K. P., & Alexander, P. A. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25*, 3–53.

Niemivirta, M. (1998). Individual differences in motivational and cognitive factors affecting self-regulated learning: a pattern-oriented approach. In P. Nenniger, R. S. Ja¨ger, A. Frey, & M. Wosnitza (Eds.), *Advances in motivation* (pp. 23–42). Landau, Germany: Verlag Empirische Pa¨dagogik.

Paas, F., & van Merriënboer, J. G. (1994). Instructional control of cognitive load in the training of complex cognitive tasks. *Educational Psychology Review, 4*, 51–71.

Pintrich, P. R. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement, 53*(1), 801–812.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 95*(4), 887–686.

Pintrich, P., & Schunk, D. (1996). *Motivation in education: Theory, research, and applications.* Englewood Cliffs, NJ: Prentice-Hall.

Pintrich, P., Smith, D.F., Garcia, T., & McKeachie, W.J. (1991). *The manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)* (Tech. Rep. No. 91-B-004). Ann Arbor: University of Michigan, School of Education.

Prensky, M. (2001). *Digital natives, digital immigrants.* NCB University Press, 9(5), 1–6.

Rao, N., & Sachs, J. (1999). Confirmatory factor analysis of the Chinese version of the Motivated Strategies for Learning Questionnaire. *Education and Psychological Measurement, 59*(6), 1016–1029.

Scheiter, K., & Gerjets, P. (2007). Learner control in hypermedia environments. *Educational Psychology Review, 19*, 285–307

Sweller, J. (1988). Cognitive load during problem solving: effects on learning. *Cognitive Science, 12,* 257–285.

Sweller, J. (1994). Cognitive load theory, learning difficulty and instructional design. *Learning and Instruction, 4,* 295–312.

Swan, M. K., & Behmer J. (1994). Educational instruction via interactive video network. *Journal of Agricultural Education, 35*(1), 13–20.

Valas, H., & Solvik, N. (1993). Variables affecting students' intrinsic motivation for school mathematics: Two empirical studies based on Deci and Ryan's theory of motivation. *Learning and Instruction, 3*, 281–298.

van Merriënboer, J. J. G., & Ayres, P. (2005). Research on cognitive load theory and its design implications for e-learning. *Educational Technology Research and Development, Special Issue: Research on Cognitive Load Theory and Its Design Implications for E-Learning, 53*(3), 5–13.

Vye, N. J., Goldman, S. R., Hmelo, C., Voss, J. F., Williams, S., & Cognition and Technology Group at Vanderbilt. (1998). Complex mathematical problem solving by individuals and dyads. *Cognition and Instruction, 15*(4), 435–484.

Weiner, B. (1992). *Human motivation: Metaphors, theories, and research*. Newbury Park, CA: Sage.

Wigfield, A. L., & Eccles, J. S. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*, 109–32.

Appendix A: Africa Basic Skill Test (Used for the Pretest and Posttest)

Name: _____

Participation ID (Lunch Number): _____

Please place the letter of the correct answer in the blank provided.

1) "AIDS" stands for Acquired Immune Deficiency S_____?
Answer: _____

A. Sickness
B. Sex
C. Syndrome
D. Syndication

2) AIDS is caused by what virus?
Answer: _____

A. HIV
B. Hepititas
C. Malaria
D. Influenza

3) Experts estimate that how many people in Sub-Saharan Africa are living with the HIV virus today?
Answer: _____

A. 300,000 (Population of Minneapolis, MN)
B. 5,000,000 (Population of MN)
C. 300,000,000 (Population of USA)
D. 22,000,000 (Population of Texas)

4) Percentage of the African population that has been tested for HIV & AIDS?
Answer: _____

A. 50%
B. Less than 1%
C. 10%
D. 85%

5) What country is Mt. Kilimanjaro in?
Answer: _____

A. Mozambique
B. Kenya
C. Zimbabwe
D. Tanzania

6) "The BIG 5 of Africa" was a term coined by the big game trophy hunters of Africa as the toughest animals to hunt on foot... Which of the following animals is NOT part of the "BIG 5"? Answer: _____

A. Leopard
B. Rhinoceros
C. Zebra
D. Lion

7) The northern African regions have strong ties with the Middle East region and are mainly from what religious faith?
Answer: _____

A. Catholic
B. Muslim
C. Buddhist
D. Judaism

8) The Sahara is the world's largest desert and dominates the northern region of the African continent. Which of the answers below best describes the relative size of the Sahara comparing it to the United States. (Relative means "About the same.")
Answer: _____

A. The Lower 48 States of America
B. States of Wisconsin & Minnesota Combined
C. The state of Alaska
D. All land EAST of the Mississippi River

9) Although only about 300 miles south of the Equator, Mt. Kilimanjaro is home to Glaciers. (large sheets of ice & snow). In the past few decades these glaciers have been disappearing due to wide variety of climatic changes on earth. If current rates of melting continue when will Mt. Kilimanjaro be free of glaciers?
Answer: _____

A. 2010
B. 2150
C. 2020
D. Glaciers will always be on the Mountain

10) "Jambo" is a Swahili term/word used throughout Tanzania and eastern Africa.What does it mean?
Answer: _____

A. How are you?
B. Bathroom
C. Hello
D. School

11) The summit of Mt. Kilimanjaro (a mountain peak in Tanzania, Africa) sits at 19,340 feet above sea level. About how many miles high is this mountain peak?
Answer: _____

A. 2
B. 3 1/2
C. 6
D. 19 1/3

12) What type of plate boundary does Kilimanjaro occur at?
Answer: _____

A. Convergent
B. Divergent
C. Transform
D. Strike Slip

13) What type of volcano is Kilimanjaro?
Answer: _____

A. Stratovolcano
B. Cinder volcano
C. Shield volcano
D. Supervolcano

14) The Maasi are a "Nomadic" tribal people who populate the eastern region of Africa. What does it mean to be "Nomadic"?
Answer: _____

A. Hunters
B. Live in deserts
C. Farmers
D. Constantly move

15) What is the primary responsibility of Young Massai Warriors (males) to their tribe?
Answer: _____

A. Lion Hunters
B. Herders
C. Runners
D. Protection

16) The staple food (most important) of the Maasi people is a mixture of what? Answer: _____

A. Milk and blood
B. Milk and goat urine
C. Blood and water
D. Water and milk