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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

OUTDOOR EDUCATION AND MOBILE LEARNING:
AN AUTOBIOGRAPHICAL NARRATIVE USING
APPLICATION-BASED INFORMATION
AND RESOURCES

A Dissertation Submitted in Partial Fulfillment
of the Requirements of the Degree of
Doctor of Philosophy

Ivan Nikolaeff

College of Education and Behavioral Sciences
Department of Educational Technology

May 2016

This Dissertation by: Ivan Nikolaeff

Entitled: *Outdoor Education and Mobile Learning: An Autobiographical Narrative Using Application-based Information and Resources*

has been approved as meeting the requirement for the Degree of Doctor of Philosophy in
College of Education and Behavioral Education, Department of Educational Technology

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ABSTRACT

Ivan Nikolaeff. *Outdoor Education and Mobile Learning: An Autobiographical Narrative Using Application-based Information and Resources*. Published Doctor of Philosophy dissertation, University of Northern Colorado, 2016.

Although mobile learning using smartphones and applications or apps have the potential to inform and educate individuals in an outdoor environment, users may find that connectivity issues and basic knowledge of outdoor environments, including both physical and emotional, could be limited by what this technology provided. This study provided my perspective as both participant and researcher on a journey over 150 miles on the Colorado Trail, using my iPhone as my primary tool for navigation and information for learning how to survive in an outdoor environment. From the beginning, the physical effects were difficult to overcome, but it was the psychological toll that became my greatest obstacle and the one element where mobile learning in the outdoor environment proved to have the greatest value. While this was one perspective, in a single study, by one participant, in which mobile learning in an outdoor environment took place, there were several themes that developed in regards to data connection, the use of fluid apps, the usefulness of static apps, and the restrictions of power in rural mountainous environments. These themes were emphasized to help future researchers further develop this information to help in the continued development of outdoor education using mobile learning.

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CHAPTER I
INTRODUCTION
No Outdoorsman

Born in Fairbanks, Alaska, then moving to Denver, Colorado, almost immediately, I have taken to many of the sports that attract outdoor enthusiasts. During the winter I snowboard and in the summer I like to mountain bike or spend time at my dad's cabin in Jefferson, Colorado. I have never hunted animals and my fishing experience is limited to maybe a half dozen times during my youth. I have spent one or two days camping, but in every instance the car that brought me to my location was never more than 50 yards away. To say my outdoorsman experience is limited would be accurate. I have never hiked for more than one day at a time, I have never backpacked, and I cannot remember ever spending a night alone in the wilderness.

Physical activity has always been a part of my life, and I often wish I would make more time for it in my adult life. In the past, there have been times when I would become interested in running a marathon, or biking a long sponsored ride. I would study and train and participate in the event, but once I completed the goal I stopped training and participating in the activity. I never considered hiking or backpacking to be a strenuous sport, but as I said, my outdoorsman experience was limited. My weight fluctuates between 205 and 215 lbs., depending on how I am taking care of myself. Sometimes, I diet with goals of losing weight; other times, I exercise with the same goal in mind. Then, I tend to throw caution to the wind.

Psychologically speaking, I think of myself as an even-keeled individual. I have a great deal of patience and understanding, but when I get pushed too far I tend to overreact. I have a greater sense of humanity for individuals than groups. I am not sure why this is, maybe because most of what I see on TV or read is focused on groups who are suffering, and not the individual stories of how one person struggled. Perhaps, the news media has callused my emotions in regards to the typical stories of death and destruction. I do find it disturbing that as a society, we choose to gravitate towards fear over facts. Additionally, I find myself attracted towards individual stories of triumph and tragedy. I believe this attraction occurs because I find the details very interesting and I like to uncover the cause and affect by exploring details.

Having gone through a hard first marriage and divorce, I realigned my idea of family values. I found that, while financial stability is important, financial success does not define a marriage. Moreover, education and knowledge are far more valuable in times of adversity than financial wealth. My second wife, and two children, ages 16 and 18, share this same value. We consistently try to “one up” each other with our grades and what we are studying, or what we are going to do when we cross our next educational benchmark. My wife and kids always come first, and I have always made sure that while my kids spend fifty percent of the time with their biological mother, I spend more time as a father coaching their teams, or making sure that I am always available to answer their questions, and meet whatever need they may have.

Ultimately, I can sum up my persona in two words: sarcastic-optimist. I search for the bright side of a situation, but embrace a cynicism that grounds me. I find myself compassionately walking in other people’s shoes, only to question their intelligence once

I have interpreted their actions. I try to give instruction and coaching, while maintaining understanding for personal interpretation so that my children and subordinates can add their own personal touch, and feel that they have achieved more than just following my instructions. I have a chaotic personality, which must embrace organization and structure in order to succeed. I am a limited outdoorsman.

I want anyone reviewing my study to have an understanding of me physically and psychologically in order to interpret how these characteristics may have affected my thoughts in the narrative of this study. I did not train for this adventure physically or mentally. Physically, I did not want to do anything to prepare or be more prepared than if I would have become stranded in a rural mountainous area where I needed to walk for help. I lacked outdoor survival background, and I felt that it was important to remain as unprepared as possible from a psychological standpoint so that my narrative remained as close to a novice approach as possible. I was and remain a limited outdoorsman.

The Idea

The idea of researching outdoor education and mobile learning first occurred to me while taking classes and learning about the use of mobile applications and smartphone use. I was intrigued by the idea of using outdoor survival applications, while immersed in an environment where the applications could be useful and potentially life saving. I felt that such research could benefit several areas of learning, where traditional methods were either unavailable, or too cumbersome to use, for example, survival manuals or access to outdoor learning through libraries or other resources.

As I began investigating apps used for outdoor information I found that there was little if any published research on the subject. Even though outdoor apps were a small

segment of available apps, small enough not to be recognized as a segment in November 2015, I was surprised to find little to no research in which to draw ideas for a proposal. The closest recognized segment was health and fitness at 2.93% of the 1.5 billion recognised Apple apps according to Statista (2015). Other segments that could have included outdoor apps included: Education at 9.44 %, Lifestyle at 8.66%, and Travel at 2.22%. Navigation made up less than 2.00% .

Most of the research on phone apps was limited to medical apps such as iCPR, and navigation applications. Some mention was made of innovative ideas such as accident detection and patient monitoring, but for the most part app use in the area of outdoor education was grossly understudied. I could not find current research to build upon or expand my interest in m-learning and outdoor education.

Once I made the final decision to study this subject for my dissertation, I looked at potential quantitative questions where I might survey groups of outdoor enthusiast to generate data where conclusions could be drawn, and a starting point could be created for my dissertation proposal. There were several stumbling blocks surrounding this idea. First, the people who I talked to and observed who hike and backpack do not tend to openly use technology during their activities. In a passive way or more as a unused accessory, they do use emergency satellite locators such as a SPOT Satellite Messenger. This type of location device uses GPS not only to locate a person but also track their progress. The device also has two warning settings that can send a message to a predetermined group of people or a general SOS that would be sent to search and rescue personnel, (Zahradnik, n.d.). Second, from my observation of the trail culture, individuals who participate in hiking related activities usually do so by themselves, or with a partner.

The groups I did encounter were usually out for a day trip or connected with a non-outdoor organization such as a church. When I did reach out to outdoor organizations or outlets that served backpackers in order to explore potential participants, the organizations were either unwilling or unable to share members' personal information or simply did not respond. Finding a large enough group of backpackers willing to cooperate with a study, and a survey regarding the use of smartphones as a tool in an outdoor environment seemed unreasonable for what I was hoping to accomplish. Finally, the apps and technology had limitations where only unlikely scenarios could provide feedback based upon the findings in this study. This was primarily due to the number of variables at work. I would have had to find a large group of backpackers traveling alone, along the same trail at the same time, using the same technology including the apps they had downloaded.

Finding too many restrictions concerning a quantitative approach, I next looked at a qualitative study, possibly ethnographic, where I would embed myself with a few backpackers, and observe how they used smartphones as tools in the wilderness. Obviously, there is an inherent problem with this idea which goes back to the observation that backpackers do not use smartphones as a tool while they are participating in this form of activity, even though as stated earlier they may use GPS location device for tracking progress and emergency communication.

My original thought was to discover if these apps held any value in regards to survival situations. If stranded in the middle of a rural area could a person use apps on their phone in order to navigate, survive, and possibly thrive? If a soldier became separated from his group, could the apps provide tools for survival in a foreign place?

Finally, do these apps actually work in this type of environment? With such a huge market for phone apps, I was curious to find answers in regards to the segment that were downloaded for outdoor purposes. This curiosity and need for information led me to conclude that I would need to be my own subject.

My next decision was where to conduct the study. I had to find a place where I would be somewhat secluded, but not completely unknown. I also needed to move over distances, so as to encounter varying conditions. I was looking for an environment that could take on different situations, for example, backpacking, stranded in the mountains, a separated soldier . . . I was familiar with the Colorado Trail from mountain bike rides, so from what I knew, the trail would fit different circumstances, and I would be isolated, but still see people from time to time. The trail extends over 450 miles and runs from Waterton Canyon at the Southwest corner of the Denver Metro area to Durango near the Southwest corner of the State. I had imagined that I would be able to cover 320 miles in the three weeks that I had taken off from work, and if that were to happen, I would extend my leave for another week to complete the trip.

Beyond the type of study, where it would take place, the apps and primary hardware, I would need other complementary accessories based on what resources were available. In a mobile learning environment where I would be physically active, equipment was required to further the interfaces use. Referred to as wearable technology, for example, heart-rate band sensors, or a portable wearable power source - portable solar panels, may be useful to help gather information or provide supplementary power to the device communicating information for outdoor learning. For this study, a wearable solar charging system was needed because I was camping outside in areas that had no

electricity. Through previous research and pilot studies, I found it useful to strap portable solar panels to my backpack to charge reserve batteries in order to gain the needed power to supplement the technology used for longer term use of portable mobile learning devices. *Tested Reviews* tested the iPhone 5s and found that “We got between nine and 10 hours of mixed usage, including streaming video, gaming, browsing, calls, taking pictures and video and listening to music” (Kypreos, 2015). Additionally, a heart-rate band could have been added to gather data on biometrics.

For the most part, phone and data coverage quality was dictated by the specific phone carrier. Based on coverage maps at cellreception.com (2015), Verizon appeared to have the greatest amount of coverage in urban Colorado based upon the coverage maps I studied. However, in rural or mountainous terrain in Colorado, there did not seem to be a clear cut advantage among the smartphone service providers. With no perceived advantage, the provider of choice was one of the four major carriers due to the fact that the current data plan I used had unlimited data use, which may have been the most useful when service was available. Again, data coverage is most important for fluid or dynamic application learning, or when synchronous real-time learning such as public sourcing is available.

Background

As the evolution of technologies has impacted human existence in many social contexts, it has also helped to augment education; “instead of the teacher being the only source of help in a classroom, students can access web sites, online tutorials, and more to assist them,” (Andrade, 2011). Assisting in the learning process technology also allows students to adapt in different ways and become more flexible while learning,

“... technology infuses classrooms with digital learning tools, such as computers and hand held devices; expands course offerings, experiences, and learning materials; supports learning 24 hours a day, 7 days a week,” (U.S. Department of Education, n.d.). While mobile technology limitations are far greater as one moves away from urban centers; “... as the rugged topography made the advent of rail, roads, and power lines slow to arrive in the mountains decades ago, it is likewise stymieing the reach of cell phone service today” (Bowling, 2013), one area that has immediate potential is for m-learning outdoor education. This area, or sub-segment of learning technologies, needs to be investigated because of the life, time, and financial savings that could be realized if these applications are proven to be beneficial. Gone are the days of folding maps and paper guidebooks, calling 911 on a landline for assistance, or using walkie talkies to radio for support as shown by a report from the U.S. Bureau of Labor and Statistics (Kendall, Nino, & Stewart, 2010). Today, mobile digital communication technologies have created the possibility of immediate response in outdoor education situations, and m-learning applications are increasing the learning experience of outdoor education and survivability in emergency situations. “The advancement of ubiquitous computing technologies has enabled teaching to be provided in unlimited locations, creating an ubiquitous m-learning environment” (Hsin-Chih, Chun-Yen, Wen-Shiane, Yu-Lin, & Ying-Tien, 2013, p. E58).

Users can gain access to crucial information, the injured can assess damage prior to EMT response, and hikers may use an application to find solutions to outdoor education situations. Furthermore, these technologies are instrumental in the prevention of dangerous situations. In 2012 the Department of Transportation created a new app, the Emergency Response Guidebook (ERG), Transportation Secretary Ray LaHood (2013)

stated “The new app is both mobile and flexible, and gives first responders the knowledge they need to protect themselves and their communities in case of an emergency” (p. 1).

Currently, biofeedback applications are monitoring patients for irregular heart rhythms and/or alerting emergency care professionals if situations arise where the patient will need health services (Semeraro et al., 2011). It is not that farfetched that these same technologies could be used to provide similar feedback in outdoor settings, triggering varying alerts depending on the use and situation tied to the application. Today, many smartphone users are aware of the applications that provide greater security in the way of information, for example, GPS navigation, but much of what is available has not been tested, examined, or researched from a learning perspective.

Practical outdoor education is what most of us are familiar with in regards to the Boy Scouts, and what we have heard and seen on television shows. “Don’t drink water that is stagnate,” or “climb to higher ground during a thunderstorm to avoid flash flooding,” are both examples of commonly known or practical outdoor education lessons. If “approached by a bear, make yourself bigger than a bear,” or “stand your ground some bears may try a ‘Bluff Charge’” (Arnold, 2013). Never eat red wild berries or wild mushrooms, are examples that may become a bit more abstract and may tend to fall in a category of urban legend, thus based less on actual education. As the continuum of education to folklore becomes more oblique, the practicality of outdoor education becomes less useful. Any practitioner of outdoor education using mobile technology to gain access to required information must be able to make such a distinction. Much of

what we consider to be practical outdoor education is built up with experience over time or scaffolded.

Survival learning is different in the fact that it is educating one's self in real time during a critical situation. In this case, a situation arises and must be overcome in order for regular process and purpose to resume, "Certainly, it has long been known that, when faced with a hostile situation, people engage in behaviors that seem counter-indicated for survival" (Leach, 2004). In these situations it is imagined that there will be an ever-increasing amount of anxiety allowing for less and less clarity in regards to critical decision processes. Using m-learning to augment these situations may, in some circumstances, improve the psychological state of the participant, or in other situations enhance the level of anxiety if solutions are not forthright. For example: A backpacker has learned through a survival application that she should climb to lower ground during a thunderstorm because of the threat of lightening, but has also learned conflicting information that says she should climb to higher ground because of the threat of flash flooding. The outcome is a heightened sense of anxiety and a distrust of this survival application for not allowing a distinction to be made in regards to outcomes, given the survival situation. This situation creates learning based upon an experience or is experiential. This experiential learning can then be added to the overall foundation or scaffold of outdoor learning.

Beyond practical outdoor education and survival information, there is one more situational event that must be addressed; instinctual behavior. In these circumstances, events progress with no precedence and no time for augmentation using m-learning or previously processed knowledge. In these circumstances, the outcome becomes the

process, therefore the circumstances and process would be considered experiential learning and would still be a building block for scaffolding, even though no augmentation had taken place. A hypothetical example would be: A hiker encounters a bear and as the bear charges the hiker he uses an air horn he was carrying as an emergency signal to startle and scare off the bear. The air horn just so happens to be the first thing he could reach in his bag, and he pressed the button completely unaware of what the outcome might be. Later, as he acquires information on bears and loud noises using a search engine on his smartphone, he learns that bears are scared of loud noises. He had always thought this was due to the idea that the bears knew a gun could kill them, not that the sound was so foreign and so loud that it scared them. Now the hiker has learned to keep the air horn available for similar situations.

Mobile learning is formally defined later in this chapter, but it is important to understand the idea of what it is in relation to outdoor education. Up to this point, I have explained mobile learning as an augmentation, or an assistant to the learning process. In most circumstances this will be the conduit by which information is gathered and presented for a lesson given in any variety of learning situations. Because of the augmentation, or the idea that the knowledge exists outside of mobile learning, and that m-learning is a conduit or a device that pulls and pushes information from databases and public computer forums, it is important to also realize that data phone coverage makes up a part or an element of mobile learning. At the same time, it is important to realize that a finite amount of information can be stored in static form, for example, PDFs in a device's memory. These ideas of scaffolding are necessary, especially when learning new content or concepts.

Outdoor Learning

Learning through experiences or “learning through reflection on doing” (Felicia, 2011) is Experiential Learning. Kolb’s Experiential Learning Theory (ELT) is a process where an individual learns through experiences instead of surface learning such as reading about information in books. The participant has an opportunity to observe their experience then reflect deciding if the experience was a success or a failure, (McCarthy& McCarthy, 2006).

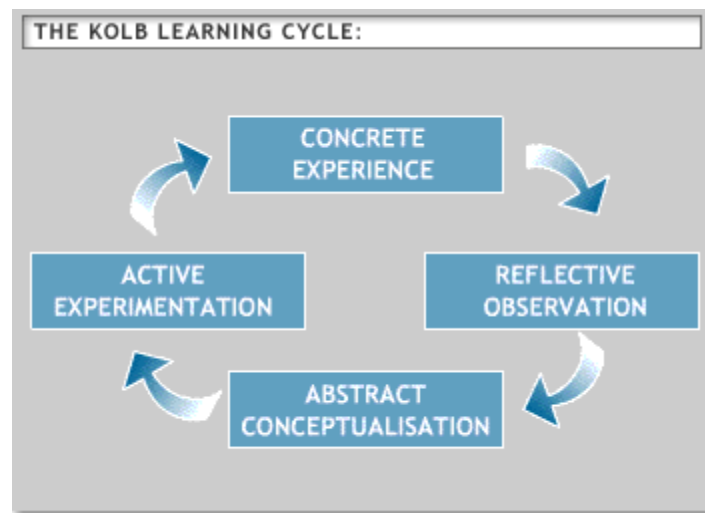


Figure 1. Kolb’s Experiential Learning Cycle. Retrieved from <http://www2.le.ac.uk/departments/gradschool/training/resources/teaching/theories/kolb> Retrieved March 12, 2016.

- Concrete Experience--The individual or participants must do the learning task or event.
- Reflective Observation – Thinking time or reflection away from the act of doing. Thinking about what just happened.

- Abstract Conceptualization--Taking what has just happened and reflected upon and making comparisons to previous experiences and previous knowledge.
- Active Experimentation--Taking the new knowledge and information and deciding how it should be used in the future. The individual might make comparisons based on past experiences to enhance knowledge or to replace stored information.

“The stimulus gained through experiences in the physical aspects of outdoor pursuits and field studies, which are related to character development and innovation in curriculum and examination requirements” (Parker & Meldrum, 1973, p. 182). Geoff Cooper’s (2012) article, “Outdoor Learning, Environment and Sustainability,” suggested several core values that when applied in the actual hands-on environment are well defined and help to build an understanding of outdoor learning. Because most of the definitions involve a small group I adapted the values to fit what I found in the study as a lone participant:

1. Recognition -- Understanding the interdependency and connection with nature and how we play a part in the environment.
2. Responsibility -- Understanding the consequences of failure or the failure to act.
3. Tolerance -- Using critical thinking to understand complexities and solve issues in a patient manner.
4. Simplicity -- Understanding the difference between needs and wants and the mechanisms that challenge our values.

5. Reflection -- The need for time and space for thought that allows us to develop a sense of values.

What I found the word “outdoors” to mean as I participated in my journey, was the idea of being a certain distance from an urban area, away from most forms of civilized service, for example, clean water, restrooms, and cellular phone connection.

The characteristics that make experiential learning a good fit for this study are the basic elements that make it easy to measure as a learning outcome given an outdoor educational situation. For this study it was perceived that behaviorism would be chosen as the learning theory of choice as a learning situation or stimuli presents itself, the participant responds, and there is a positive or negative outcome to the response, causing reinforcement. After further research during the development of the dissertation Kolb’s Experiential Learning fit the learning situations and experiences better due to the reflection that occurred during a learned activity and the idea that experiential learning is active and applies to real-time therefore overlapping and co-existing with Vygotsky’s (1978) scaffolding.

To explore these ideas in an authentic learning environment, this study embraces an outdoor learning experience through autobiographical narrative research. Specifically, the following research questions guided the exploration:

- Q1 How does the increased access to smartphones and smartphone technology influence an individual’s ability to use mobile learning for outdoor education?
- Q2 As an individual gains knowledge through m-learning for outdoor education, will the information or knowledge transform to be adapted beyond its original purpose?
- Q3 How do environmental factors affect an individual’s ability to learn using mobile applications?

Definitions

Adaptive Learning. A process of constructing relations. These relations become more complex, and at the same time more automatic, with increased experience and practice (Shute & Towle, 2010).

Applications or Apps. Computer software designed to help the user to perform singular or multiple related specific tasks (Franklin, 2011).

Augmentation. A situation where a device adds information into the existing world. For example, the view through a camera can be augmented through information generated from knowing the location of the camera (via GPS) and direction of vision (internal compass). Similarly, auditory information can be triggered by proximity to add context such as historical information (Quinn, 2011).

Mobile Learning (m-learning). “Any activity that allows individuals to be more productive when consuming, interacting with, or creating information, mediated through a compact digital portable device that an individual carries on a regular basis, has reliable connectivity, and fits in a pocket or purse”, (eLearning Guide. 2007).

Outdoor Education. Outdoor education can be simply defined as experimental learning in, for, or about the outdoors. The term ‘outdoor education,’ however is used quite broadly to refer to a range of organized activities which take place in a variety of ways in predominately outdoor environments (LGC Team, n.d.).

Public Sourcing. Using social networking to gain information or develop a consensus from a public forum regarding a similar interest.

Research Problem. Many problem or issue based situations have a predetermined instance in which an individual will take it upon themselves to gain more information or

knowledge in order to problem solve or overcome the issue at hand. Using m-learning in outdoor education settings provides immediate information or knowledge, but factors unique to outdoor learning may affect an individual's ability to process and correctly use information and knowledge gained. Some of the factors are internal or physical and may include the effect of physical strain, nutrition, hydration, and mental health. Other factors are external and may include equipment failure, adverse weather conditions, difficult terrain, lack of power sources, and loss of communication networks. Additionally, these and other unknown factors may affect an individual's ability to successfully process and use outdoor education information from mobile sources.

Research Purpose. To gauge the usefulness of outdoor education applications via a smartphone, its platform operating system, website interface, connectivity, and social public sourcing through the researcher's individual experience of outdoor education experiences using this technology and interpretation of information and knowledge acquired.

Smartphone. A category of mobile device that provides advanced capabilities beyond a typical mobile phone. Smartphones run complete operating system (OS) software that provides a standardized interface and platform for application developers. Compared to standard mobile phones, smartphones usually have larger displays and more powerful processors. Applications written for a given smartphone platform can usually run on any smartphone with that platform, regardless of manufacturer. Compared to Java or BREW applications, native smartphone applications usually run faster and integrate more tightly with the phone's features and user interface (Phone Scoop, n.d.).

Zone of Proximal Development (ZPD) - “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotskiï & Cole, 1978, p. 86).

Narrative Voice

As the participant in this autobiographical narrative it was my intent to record and write my experiences as they occurred in my own voice as participant. The narrative was broken down into three Acts, Act I--Inability, Act II--Comprehension, and Act III--Mastery, showing a progression of my ability to access and interpret information. After each Act, the information was analyzed from a researcher's point of view.

CHAPTER II

ACT I--INABILITY

The narrative voice from the participant's perspective.

Inability

It was around 10:30 p.m. when my parents dropped me off at the entrance to Waterton Canyon, the northeast portal to the Colorado Trail. I wanted to get on the trail and away from them as quick as possible. My mom was extremely concerned and trying to talk me out of the trip, but my dad was calmer. I believe he did not think that I would go through with the three week journey. After wrestling my gigantic overweight backpack from the tight back seat of their sub-compact car, giving hugs and handshakes, I immediately scrambled up to the entrance to get out of eyesight, for their sake and my own sanity. I was supposed to have my wife drop me off at 6:00 a.m. on her way to volunteering at a dentistry event, but University issues, as well as my own preparedness had caused a delay until late morning. My last option for transportation was my parents.



Photo 1. Waterton Canyon Trailhead. Ivan Nikolaeff (2014).

The morning was overcast but dry. I scrambled up to the Waterton Canyon sign and posed for a selfie, “So it begins . . .” was my post on Facebook. I was excited and checked my power management system, consisting of solar panels connected to a battery system then connected to my iPhone. The system had worked well in the past during my pilot studies, keeping the battery system fully charged and the iPhone at 100%. Because of the integration of wearable power and its use to power a smart system, the iPhone, I considered this setup to be wearable technology, which would assist me as I used the iPhone for information in order to learn outdoor lessons from mobile technology. In addition to the power system, I made sure I was connected to a few applications that I thought would be valuable for the Journey. These included: Map My Hike, Runtastic, The Colorado Trail Application or CT app, and a GPS hiking application. I knew phone and data coverage would cause issues with some of the applications, but I figured I should determine what those issues might be once I had a problem, and what the

circumstances might have been that caused the problem. For this study connected apps are fluid, meaning that they pull and push information as needed from a signal or connected source such as the Internet. Other apps such as iSurvive and SAS are static and basically rest in the iPhone's storage as a PDF file, always available like a book, map, or guide.



Photo 2. Goal Zero Nomad Solar Panels [digital image]. Retrieved from <http://www.goalzero.com/p/179/nomad-20-solar-panel>

Waterton Canyon, owned and operated by Denver Water and managed by Denver Water and the National Forestry Service has a service road running parallel to the South Platt River. The road services vehicles, hikers, and mountain bikers for about 6.5 miles before turning into a single-track trail only for hiking and biking. Most of the visitors to the area are those who hike or bike out and back the 5.5 miles to the Saratoga Springs Dam. It was a Friday as I began my hike up the service road, and every few minutes a bicyclist or jogger would pass. One jogger stopped next to me to ask me about my solar panels. He told me he would jog for about four plus hours per day, and with the biometric measuring equipment he used on his watch, his battery would usually run out before he completed his exercise. He wanted to know if there were solar panels that

would fit his hydro pack and maybe plug into his watch. I exchanged information with him concerning my setup, and was happy that someone had already commented on my wearable technology.



Photo 3. Waterton Canyon Map Near Trailhead. Ivan Nikolaeff (2014).

As I continued up the road I came around a corner to find another hiker sitting off to the side resting. As I approached, we greeted each other with what would become the common introduction along the trail, “Hi, where are you headed?”, “I’m through hiking, you?”, “Oh, I’ve only got three weeks off from work, so I will see where that takes me.”, “Well, good luck”, “you as well.”, or at least some resemblance to this dialog. As it were, this gentleman’s name was Bill and he was from Black Forest, Colorado and owned a chocolate company, or at least he called himself a chocolatier. We talked for about 15 minutes. He was giving himself about ten weeks to get to Durango, and my first question was, “what about the snow?” He said he would pick up winter clothing in a few weeks. He also told me that he had a trail name “Sir William the Velvet” or something of that sort. I thought trail name? How do I get a trail name? Bill was a bit slower than I, so I bid him farewell and pressed forward. As I worked my way up the road, I began to notice the

weight of my pack. The most I had carried before was about 26 pounds during a couple of day hikes, with no prior training or experience. I really worked hard to minimize my pack weight starting at 57 pounds, realizing that was way too much I pulled out several consumables and reduced the weight to around 53 pounds before embarking. I knew from the little that I had read about packing from Pinterest, a website where followers can post photo, videos, and diagrams, that 40 to 45 pounds is the absolute maximum for through-hikers. I did not really know the significance of “maximum,” but approximately 5.5 miles in, I was beginning to understand. I stopped at a picnic spot to rest, and also to adjust my pack. It seemed as though I was carrying much of the weight on my shoulders as opposed to my hips, which I knew from eavesdropping at REI was a bad idea. I had decided to do as little preparation and research on preparation as possible, but later learned that I am supposed to distribute the weight on my hips. These early mistakes were due to my idea of conducting this research from the most novice approach possible. It was my intention to have as little knowledge as possible in order to expand upon the greatest number of situations a person might find themselves in based upon similar circumstances. All of a sudden, my novice approach to this whole experience started to seem like it would be a rapid downfall. I tightened my waist strap as tight as it would go. The pack I had chosen was offered to me by a well-respected brand at their employee pricing, for my research and was top of the line. I choose a pack size for those with 34 to 38 inch waist which is where I was at the beginning of the trip, well closer to 38 than 34, but I still crammed myself into the smaller waist size because of ego. After resting a bit, I adjusted my pack and checked my equipment. The apps seemed to be tracking fine and the power system seemed to be holding at 100% for both the iPhone and the external battery. Off again, I

made my way up the narrowing road to the trailhead, again I took a minute to compose myself, well maybe 20 minutes. As I rested, it began to drizzle so I put a tarp over my pack, and donned a waterproof rain jacket. Soon Bill reappeared and we exchanged pleasantries again. We talked a bit about what I was attempting to do which lead into a conversation about exoskeletons, and their use with people who have disabilities. Bill was very interested in this subject and told me he would be investing in exoskeleton technology in the future. With that said I let him pass and progress up the first set of switchbacks on the Colorado Trail. According to my CT app, a digital smartphone guide for the Colorado Trail, which uses GPS tracking for navigation and location, I had completed 6.5 miles of the days estimated 16 mile trip.

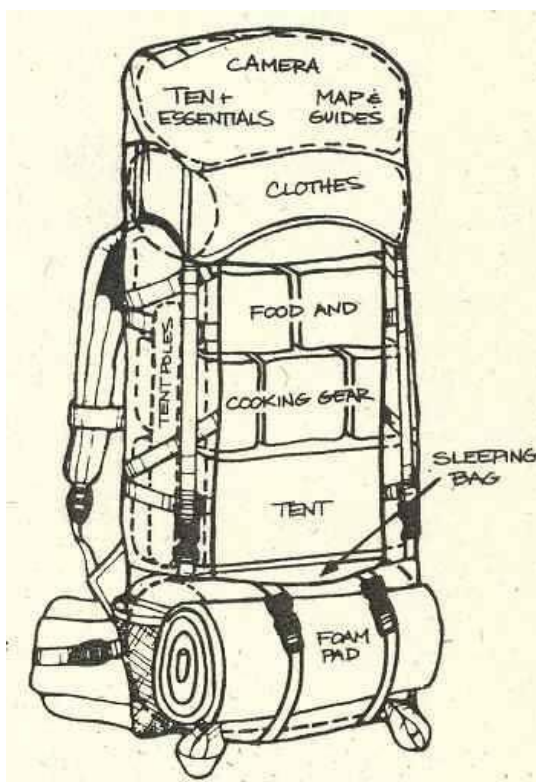


Photo 4. Backpack [digital image]. Courtney Kozlowski, Retrieved from <https://www.pinterest.com/pin/166985098660048470/>

About one and a half to two miles further into the climb up and over this segment I again ran into Bill, he was resting. We exchanged recognition of how slow we both were, and that is when he gave me what turned out to be one of the best pieces of advice during this trip, even though I did not realize it at the time, he said, “Ivan, just hike your own hike.” This would stick with me and help bring about an epiphany or two before my journey ended. After passing Bill for the second time I would not see him again, but from time to time I would receive an update about his progress.



Photo 5. End of Service Road Waterton Canyon. Ivan Nikolaeff (2014).

Waterton Canyon, and this entire first segment is a very busy route. I observed the primary users to be mountain bikers, day hikers, fisherman, and through-backpackers. You can pretty much count on seeing another human being about every 30 minutes or so, and sometimes curse the mountain bikers who practically run you off the trail, even though they are supposed to give way to an approaching hiker. As I climbed further out and away from the canyon and river I took notice of the elevation tracker on the CT app. At this point this did not mean much to me, but was kind of a neat visual to track how

high I was going in elevation, at mile 8.2 I was at 6543 feet of elevation. It added a three dimensional element for tracking my progress.

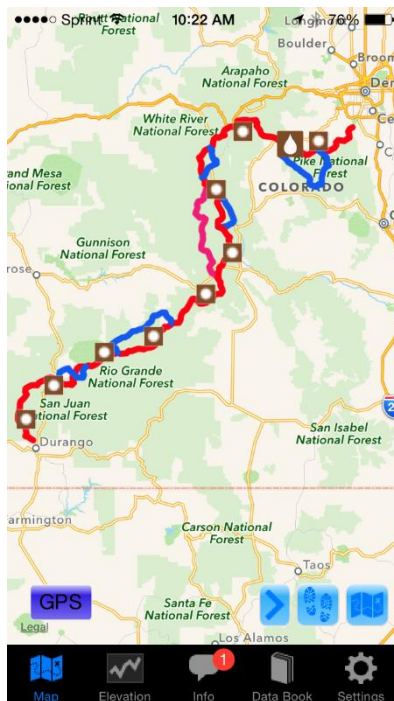


Photo 6. Screen Shot of Colorado Trail App Map. Ivan Nikolaeff (2014).

Time really slowed down while I was hiking. Right from the start it felt as though two or three hours have passed for each one that actually did. The effort of carrying so much weight on my back was fatiguing right from the start, and as each mile passed, I was surprised at how slow my progress was. I know and think about the speed at which I walked during my lunch hours at work and that it was not out of the question to cover 4 miles in an hour at a rapid walking pace. Out here in the wilderness going uphill it seemed that 1.5 mph became a stretch. If this is so, then reaching 16 miles this first day is going to require about 12 hours of hiking. I think, and only hope that my pace will quicken during the downhill portions of the trail. My molasses mobility begins to build

stress and I feel as though I have really over reached this time, I am only into my third to fourth hour of a three week excursion, and I feel as though I would not complete the first day.

I have never spent the night out in the woods or as I can remember any urban environment alone. My experience with hiking has been limited to a handful of daytrips as an adult, and maybe one or two week-long summer camps. I have slept in a sleeping bag and a tent, but these were times when I went car camping with buddies, and drinking was involved. If I remember correctly, I had always told myself I could never sleep out in the wild without some form of liquid courage to numb my senses. The point is that I am no mountain man, I enjoy snowboarding and mountain biking. I take my yearly pilgrimage to the ocean for a surf lesson and an additional day of surfing solo, which I am not good at, but enjoy. As a matter of fact, I hate guns and knives. I despise guns because of the ease of destruction, and from what I have heard, more people get their own gun used against them more times than not.

When preparing for this trip most of those that I talked to said “bring a gun.” Really? In preparation for the trip, and to test mobile learning platforms I researched hiking protection through YouTube. What I found was that guns really make bears mad, and that bear spray according to the dozen or so demonstrations I saw was 100% effective. Therefore, I decided that bear spray would have to do for protection. Beginning the trip I had the spray at the ready at all times. It seemed that everyone was sure I would wrestle a bear on a daily basis, or at least that is how friends, coworkers, and sporting goods sales people made me feel. My other form of protection was a fairly large knife. As a matter of fact, I had to give my age and signed consent to purchase the knife. I believe

it had an eight-inch blade. I know I have larger knives and cleavers in my kitchen, but I still had to gain authorization for the purchase of this knife. At times I thought to myself how I might use this knife as protection, which led to some clever ideas. I could attach it to the end of a pole and run it through a bear's heart, or his skull in case he was wearing a helmet, or maybe I could throw it at a would-be attacker, because I have never thrown a knife, and I am sure it will stick exactly where I need it to so that I may extinguish the threat and move on. Hey, you've got to think about something when you're hiking.



Photo 7. Bear Sprayed with UDAP Pepper Power Bear Deterrent. YouTube (2009). Retrieved from <https://search.yahoo.com/yhs/search?p=youtube+bear+spray+video&ei=UTF-8&hspart=mozilla&hsimp=yhs-001>

Now half way through the day's hike, I find myself checking my applications more and more to help visualize my progress. The problem with constant monitoring is that it somehow slows my progress even further. I climb hills and round ridges looking at the mapping apps only to find my "blip" has only progressed one "blip" over. Once I joined the single-track trail, I became aware of the change I needed to make in my field of vision. With the rough and rocky terrain, my world became much smaller because I became aware of the need to watch exactly what I was stepping on, while looking to

about 12 feet in front of me to see where I was going. Sightseeing or just looking around became dangerous when moving, and had to be held off until I stopped. With each new lesson learned, I became increasingly aware of the need for planning and pre-trip preparation of which I had little to none. The final four to four and a half miles I would soon learn would become the most dangerous, a theme, which would repeat itself day after day over this trip.

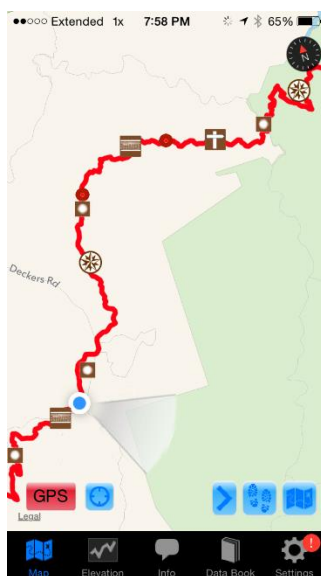


Photo 8. Colorado Trail App with GPS Blip. Ivan Nikolaeff (2014).

At somewhere around 12 miles, I gazed at my iPhone and had noticed that I was approaching the last 4 to 4.5 miles of the trail for my first day. Each app had shown that I covered different distances. Some of the apps that I have used in the past make up my most probable route when the data connection is lost. From what I understand my position is triangulated based upon my cellular signal and when and where I ping a tower. This only works if my signal is detectable by the cell phone network. In areas where there

are several towers for detection it is easy for the app to correctly show my location on a virtual map. When I am in a mountainous rural area there are not enough towers if any to detect my signal and triangulate a position, so when I am detected I show up as a dot on the virtual map and all the software can do at that point is draw a correlating line from the last place I was detected to my current location. This works when you need a rough estimate or when you are not depending on the information for any reason; but when it comes to navigation, nutritional information, or biometric information, a user may need accurate information for any number of reasons, some which could be critical. An example of how navigation could be critical is easy to see, but what about other information? Say an application boasts that it gives accurate nutrition and caloric expenditure. This could be critical in circumstances where an individual must measure this information, to take insulin in order to live a normal life. If the application becomes disconnected and only provides an estimate based upon interpolated information, the situation could become serious. Considering this, I know that I am anywhere from 4 to 4.75 miles to my campsite. These final miles I am familiar with because I used this as a test site for my equipment, specifically the backpack and camp stove. My introduction of the Jetboil stove came with another YouTube video, but I thought at a minimum I would try it once before using it in my primary study.



Photo 9. JetBoil Solo Review. ReeperzOutdoors (2012). Retrieved from <https://www.youtube.com/watch?v=ipCJgKAvBqY>

From my prior pilot hike, I knew that the final four miles would take an approximate two to two and a half hours to complete. I stumbled into my first campsite beyond exhaustion around 7:00 p.m., 2 hours later than what I first estimated. Having never set up the tent or camp before, it took about one and a half hours and pushed well into the dark to get ready for bed. Before going to sleep, I looked at what I would begin to call “the technology.” The external battery had wound down to below 60%, but the iPhone remained at 100% power. I also noticed that there was little, if any connection at the campsite. This surprised me because I had only hiked for one day and I was just entering the mountains. I would still consider myself in the foothills of the Denver Metro Area. I could not connect to the applications and texting was intermittent if available, at all. The CT app seemed to still work given the limitations with a blip in the exact place I sat on a virtual map at a virtual elevation. It was dark but soothing with the South Platt River 100 yards away. This would probably be the latest I would go to sleep during the entire trip; I believe I fell asleep around 10:30 p.m.

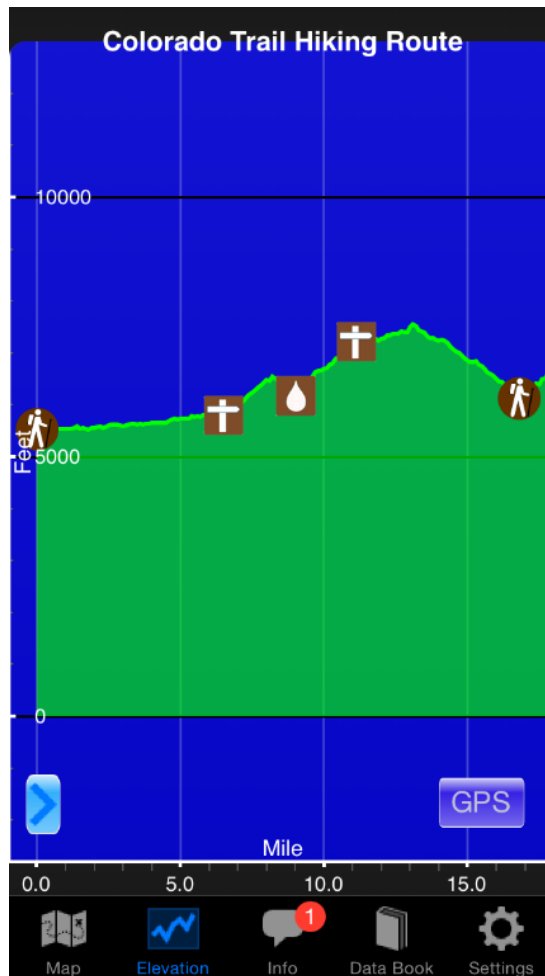


Photo 10. Screen Shot of Colorado Trail App Elevation Screen. Ivan Nikolaeff (2014).

The next morning I awoke about 8:30 a.m. and found that I had learned nothing about breaking down camp, the teardown took one and a half hours; so I was not back on the trail until 10:00 a.m. I knew the next section ran between 12 and 14 miles through what looked like one of the recent burn areas. Some of the mental notes, as well as field notes that I had taken from the day before included, taking more time for foraging identification using an application, looking at who I was as a novice participant in an outdoor survival situation, packing the pack, and what I had packed because the weight

was so great, and finally using the GoPro camera to record more narration and video. I had spent so much time trying to cover distance that I never took the time I wanted to record the information I needed. In the pilot studies the GoPro camera worked well with short video and narration capture, but that was more staged than practical use. With so much attention going into every step, and the fatigue that accompanies the miles covered, the use of the camera became a bigger burden than an answer to the fatigue.

Every hike that begins at a stream begins uphill. Streams are set at a low point of elevation, even when I descend a hill or mountain. My second day begins with a climb up and away from the South Platt River; I will climb from an elevation of 6,100 feet to 7,600 feet. Not a big deal, right? Well elevation goes beginning to ending, you may go up and down several times, or climb way up and way back down. I did not keep track of total elevation gain, but I believe every step was like climbing or descending a staircase and the feeling in my knees and thighs confirmed that.



Photo 11. GoPro Camera Hero 2. Retrieved from <http://i2.cdscdn.com/pdt2/u/t/d/1/700x700goprohero2outd.jpg>

The second segment of the CT is very dry; I believe all of it was in a burn area with few patches of trees. I climbed, and climbed, and climbed, and sometimes went downhill, but usually climbed. At the end of the segment, my wife and kids were meeting me so that I could make any last minute adjustments to my supplies. Of course with my pack being so overweight, a major adjustment was projected. As I moved up and over the scarred ridges, I came face-to-face with my own realization that I simply was not in the condition for this type of activity. At the same time I was noticing the pathetic shape of my body and respiratory system. I also began to waiver mentally. I had been gone a little over 24 hours, and I was whimpering about missing my wife, my kids, my dogs, and everything. I was not more than 22 miles from civilization, as I knew it. I was a pathetic excuse of an outdoorsman. Hell, I have never missed those dogs! When I crossed desolate areas that are dry and rocky, I instinctively look for rattlesnakes, and I was not disappointed. As I stepped, a baby rattlesnake made a quick gesture with his tail then scurried under a rock. At least I believe it was a baby rattler; either that or a small snake jumped at the same time a grasshopper made that rattle noise they sometimes make.



Photo 12. Second Day Burn Area. Ivan Nikolaeff (2014).

Even though the distance did not seem great, the pace at which I walked coupled with the heat, and the landscape made the hike nearly unbearable. I could feel every muscle holding up the pack, and the pack wanting to tear away from my body. It began to dig into my sides where I could feel my skin rubbing against my outer garment, and the waist strap, slow and like fine grit sandpaper. I knew I was scarring, and that could cause greater issues. The amount of effort, along with my clumsy unknowing way of getting the pack to my back from the ground sounded like too much effort, so I soldiered on, fatigued and exhausted, I had only traveled about 25% of the distance I needed to make this day.

After topping out and rounding another hill, I stopped to let a family of mountain bikers pass. Usually bikers passed with a “hello” or “have a good one”, but this time they stopped where I was, maybe because I had found one of just few shaded areas during this whole segment. At this point I had decided to remove the pack and take in some water. The elder bicyclist started a conversation, same as most hiker to hiker conversations by asking where I was going or where have I been. I explained what I was doing with my dissertation, and he wanted a picture of my setup with the solar panels. Again, it was nice that some strangers took an interest in what I was trying to accomplish.

After this stop, I hiked for about another hour or so then decided to stop and make some lunch. I had used the cooking stove this morning and the night before. I can say that it is a waste of water to use the stove if you are away from a water source. I have to use water to cook then it takes a liter or two to clean the stove properly. When I am only carrying five liters, and I use between two and three liters for a meal, water begins to become very precious. During my pilot study, I cooked a Knorr side dish of broccoli and

rice and it just tasted awesome after a hike. Now I tried another side, and just simply had no stomach for it. I really had to force feed myself, about a tenth of what I had consumed during the pilot study. What should have been about a ten minute lunch break, turned into about 45 minutes, and I was again running behind schedule. At this point what seemed to be the only reliable fluid application was the CT app, which seemed to be using some type of virtual GPS. I wondered how this could appear to be so accurate while most of the other connected or fluid applications were so far off with their navigation and route tracking. Again, I did take some photographs to use as comparisons for my edible plant applications, and I did collect some berries to photograph up close and possibly taste later.

As I continued to move throughout the day, I noticed that my power consumption continued without any sign of recharging. Also, a bigger concern was no data or phone connection throughout most of the day. I did not expect this at all, and was becoming more and more concerned with my miscalculation. Based on my two prior pilot studies, and the coverage maps I had looked at regarding cell phone coverage, I expected to receive a signal at least 30% of the time I was hiking. Obviously, this was not scientific and only my assumption based on my own experience, and what I saw on a map of cell phone coverage, that may have been skewed based upon the purpose for generating the coverage data, e.g. maybe the map used to solicit service for one of the phone service providers.

As I soldiered on, I began to become more and more depressed, physically showing emotion, whimpering, and feeling more distressed at the idea of being alone for so long. This had become an immovable mental obstacle, and the only way I could keep

one foot in front of the other was to know that my wife and kids were six to seven miles ahead of me. From time-to-time a text would dribble across my phone asking where I was. It turns out they had been at the rendezvous point for a bit, and were waiting my arrival. At one point I had relayed where I was, but had read the map on the phone incorrectly, and put myself an hour to an hour and half ahead of where I actually was. When I realized my mistake, I almost stopped in my tracks with sadness, and a longing to see familiar faces, wrap this up, go home, and find another way to capture the information I was seeking. I was so sad.

As I got closer to the meeting place and what would be my camp for the night the phone signal grew and text messages were coming in real time. My wife and the kids were getting very impatient and even though I wanted and needed to stop and rest, I just kept putting one foot in front of another. It was probably the slowest pace of the entire trip for the amount elevation gain. By the last mile, I could only manage between a half a stride and a third of stride. I must have looked so old and frail, but the weight mixed with my complete inactivity over the last year had consumed both my physical and mental being at this early point in my travel. This, mixed with little to no water during the final five mile stretch completely broke me. I was tired, with very little understanding of the physical preparedness need for such an activity. In addition, as my mind wandered I continually withdrew to the state of my family. I was worried about them and felt responsible for anything that might happen to them or myself while conducting this research. As I walked along and crossed County Road 126, I could feel that this was it, I could not continue.

After crossing the road, I made my way up the dirt road to a camping area, the type of area with readymade fire rings and restrooms, albeit outhouse style. I soon saw my wife's car and the children, well I call them children, my daughter is 17, and my son 14, trying to start a fire. I could barely walk to them, I hurt so bad, and I was a flood with emotion. I felt like tears were filling me up from my feet to my eyes. Right away my wife could see I was in despair, and I believed her first instinct was to put me in the car and drive me back. One major issue that saved my trip and my returning to civilization early was while waiting for so long they had drained the car battery, to the point of where it just clicked when she tried to start it.

As I drank the water that they had brought with them, and my wife tried to deduce what the car problem was, the auto issue began to replace my thoughts of despair. At first we had thought it was the starter, and my wife solicited the assistance of a few mountain bikers that were returning to their cars after a day out on the trail. I hung back, primarily because I was too exhausted to try to reason out what the issue might be with those who were more logically capacitated at this time. After several attempts, and hitting different parts of the engine over and over, the decision to jump the car with another car was reached. This worked right away and a hasty decision was reached for my family to get going so that they would have enough power to reach home, and not have to start the car again in this type of environment. While waiting I shed about 8 pounds of food bringing my pack weight to about 45 pounds, kissed my family, and sent them on the way without reconciling my earlier thoughts.

I set up camp, not realizing that I had to be a determined number of feet away from the road. This was a hub for mountain bikers and motocross cyclists, and if that was

not enough, it seemed as though a gun club with a shooting range was very close. The sounds of the evening were not of nature, but that of those three elements. I think my greatest worry was that some motocross guy might not see my tent and run me over in the waning twilight. I was again alone and very sad, but with no phone, or data connection a hasty decision was reached by my wife and myself to secure an emergency GPS system , which I knew existed but had not researched, just in case I got into real trouble. I was to wait here until she returned early in the morning to deliver such a device. As I sat reflecting back on such an emotional experience, I researched a little bit on one of the military apps I had downloaded. I studied the concept of mental fatigue in survival situations, and learned that the mental roller coaster that I had ridden all day was almost verbatim what a lone survival victim goes through. I also learned about controlling stress, and not moving to distress. Distress causes mistakes and sometimes fatal actions by a survivalist. I really felt that learning this new information made sense, and would help to build a mental foundation to continue and know that this was natural. Still, I missed my family more than I could ever imagine. Funny that I had just seen them.

What was supposed to be an early meeting with my wife, turned out to be a day long wait. With the extra time, I re-inventoried my supplies and equipment and read a bit more from my static apps, those that are basically PDF guides on the iPhone. For me these apps are especially important because they do not need a connection, and I can store several manuals in a space much smaller than their paper versions. I was surprised that in my two primary static survival apps, mental survivability was the first thing addressed, and reflecting back on this makes perfect sense. Given the fact that I do not know what situation might come my way, I first need to be mentally prepared to deal with the

circumstance, then, physically prepared. So I am waiting, and I am waiting. This is the first real downtime I have taken over the last two days. As I am inventorying the equipment, I notice that I am almost out of rechargeable power, and that the solar panels may not have been working at all. This begins to worry me to the point of where the idea of no power consumes all of my thoughts. I make sure the battery backup and solar panels are in the most direct sunlight possible and continue to wait for my wife to deliver the emergency GPS system.

Close to 1:00 p.m., I receive a text that she has secured what she was looking for, and that she was on the way. I laid on a picnic bench as different people visited the site for differing reasons, completely bored, and tired of waiting. At one point a group of women pulled up with horse trailers and prepared their horses for a long ride. One of the ladies must have been the daughter of another woman in the group, but I have to say, I have never heard such foul language out of a young lady's mouth. She cursed the horse, she cursed the weather, she cursed the day, she cursed everything, and pointed a finger of blame that could have covered the whole county. I sat there and just felt as though I was losing my intelligence from listening to this idiot. I thought back when my kids were young. They both received one spanking, never a second, never again, because I believed that the torment of the one and only spanking was enough to use as a threat for most of their young lives. The memory or even infamy of the one spanking would grow to become a much bigger deal than it ever was, thereby accomplishing much more than any other spanking ever would. If this young lady, of about 19 to 23 years of age, had been my daughter, I would have blistered her butt for the language and attitude she presented that day. With that said, soon after they rode off, my wife appeared.

What was supposed to be a quick hand off of GPS technology, which would have provided some security and given me some reassurance that I could get help if needed, had now consumed more than half the day. In-addition, the GPS system, which would allow me to text using a satellite connection, did not seem to be activating so after about an hour or so I told my wife to go ahead and return it, or try to have the system fixed and we would try the hand off again later. Maybe 15 minutes passed after we parted, I received a text that the system was now active and working, and to stay put so she could bring it to me. If two people could get lost and not be able to find each other, it would be my wife and I. We both ran into people that had seen one or the other of us, but for whatever reason these people seemed to have a worse sense of direction than we did, and they lived up here. One lady, named Vicki was so sweet and wanted to be so helpful, but she really sent us both headed in the wrong direction, and helped in only fouling things up worse than ever. The area that I had just left has a few trail junctions, and so it is easy to take the wrong one. The short of it was, we could not find each other, and so she drove ahead to where she thought I would cross a road, and it turned out that I had already passed that area. I had to backtrack several miles, but in the end we eventually found each other, and I was able to get back on the trail for maybe an hour or two before eventually having to again setup camp, as night was falling.

Settling in for the evening, I made note that the iPhone had dropped to 63%, all power was lost to the Sherpa, the backup iPhone 4s was down to 80% but in airplane mode, the GoPro camera was dead, and an iPad I had brought to help document notes had 33% power. This was now a major issue, so I decided to power down everything. I knew losing the iPhone 5s would end my study prematurely, so I decided to ration the power

until a solution could be found. I assumed that the battery backup system had failed, or that the solar panels malfunctioned. I also assumed this because the power system had fried the GoPro camera, and the charging of the battery backup was slow to non-existent. I learned later on that I had far over-estimated, and misused my solar power system. Even though I had tested the system several times, I had not thoroughly studied the instructions to learn that the panels need to be connected to the proprietary battery to regulate the amount of power going to the device. I am not sure if this was an oversight or part of my approach to remain as novice as possible.

That day I had only completed five miles, a blister on my toe looked as though I had grown another toe about the size of a grape, and I was now in an emergency power situation that could jeopardize everything I was hoping to accomplish. I did note that the 4s in airplane mode only seemed to use about 1% of its power per hour, even if I was using the non-connected applications. I needed to read about what to do with this blister. After doing so, it turns out the chapter(s) in the iSurvival app that I did read was on medical procedures and maintaining cleanliness. This really helped with my developing problems where chafing and rubbing were causing developing and persisting blisters and scabbed skin. As I began to complete my final conscious thoughts, I realized that my pack was still too heavy, and that I would not make it another week at a weight of over 40 lbs. I again saddened with the idea of being away from my family, and I now knew from what I had read that this was natural, but it still affected me in the same manner.

At daybreak, I was already five miles into this segment. If everything would have gone as expected, I should have been through this segment and closer to Kenosha Pass, the first major milestone of the journey, but that is not how things happened. Powering up

and down the phone meant that I had to ration out about five to six, what I call, phone checks. This was where I would power up the phone, check my location, and other information such as water sources, and elevation. Then hopefully I would be in an area, and on the phone long enough, to send or receive any pertinent texts. When I had proposed this study, I was hoping that public sourcing of information could be at least a contributive element to the study, but with no connectivity, and a rationed power supply, this became impossible. With that said, I do appreciate the words of encouragement and thoughts that were communicated via Facebook. Even if I was connected, the power drain from an extended data connection would have had me down to only a couple of check-ins per day, and I needed to make it about five days on a 60% charge.

The hike on this day was one of the loneliest in the entire trip. At the beginning, I was mostly on a forestry road, but the road was not smooth, actually it was not like a road at all. It seemed that for miles, the road was covered with rocks that were jagged, too large to step on, and too numerous to step around. What should have been a real opportunity to look around and photograph plants, and animal scat for later identification using the appropriate app, began to be my longest day of looking at my feet. Watching every step so as to not twist an ankle or tweak a knee. As I wandered down the road, I looked over to see a guy packing up his camp. This was unusual because it was so late in the morning, and it was the first time I saw someone camping off the trail just out in the middle of the forest. My imagination began to get away from me. When I saw him I felt a bit like maybe I had just seen a leprechaun, or some mystical forest humanoid. When I am alone, and especially early on, my mind really ran away from what I perceived to be reality.

The road or trail continued on and on and on and on, every step as treacherous as the last, and maybe the next even more so because of the perpetual fatigue. As I moved onto single track trail I began to become spooked by my journey, and for the first time the trees and shrubs really began to close in on me. I believed that bears, mountain lions, and escaped convicts were watching me from the shadows, and I could not see them. I felt that this would soon be the end and that I was brave for continuing, but that I was also stupid to allow myself to die in such an irresponsible way. As I came to a stream crossing I stopped to refill my water containers. This usually required digging out the three-one liter bottles as well as my hydration bladder, emptying these vessels of their backwash, refilling them with stream water, then adding water treatment (iodine), letting that sterilize the water for 30 minutes, then adding balancing tablets. What I had learned about water sterilization from applications and YouTube, was that water tastes better when filtered as opposed to chemically sterilized, but with so many other things backpack related, the easier route was chemical sterilization. I truly believed this was a major contributor to my three weeks of diarrhea during the study.

As I filled up and prepared to eat some lunch, the human that I thought maybe a troll suddenly appeared. He turned out to be a young man that was hiking through for the week, his girlfriend was picking him up at Kenosha pass, and it was again comforting to know I was not alone out on the trail. We talked for a few minutes; he was interested in how I was navigating using the iPhone and applications. I was a bit surprised that really no one I had met, with the exception of Bill on the first day, used any form of smart technology for their hiking trip. I know people must use technology of some kind, but no one I had talked to. Bill loaded topographical maps on his phone, but who is to know if

he ever accessed them. I worried about him, and how he was getting along. The young man I met was named Dylan. He told me he was a bit slow, but seemed to be in good shape with a light setup, so I had a feeling he would move faster than me. We shared a few short stories of what we had experienced so far, then he was off. I would see him again later in the day, and that situation again took on a mystical reckoning, but more from his perspective.

As the day, the hike, the hours, the strides, the minutes, and the steps progressed a detour took shape which basically ran straight up the mountain. I later learned from a gentleman that managed crews of volunteers that worked on the trail, that this detour was put in place to circumvent another burn area. The trail went very vertical in relation to the elevation, and this was the first time I really began to pay closer to my progress based upon elevation, as opposed to positioning on a map. I climbed and climbed, and kept repeating the words of Sir William, “hike your own hike.” I knew I could not stop on this mountain; it was too steep to set up camp. I had to get to the top, but at any time it seemed the top was in sight I just crossed another bluff and the trail kept winding up and up. Also, this detour was not well established, and so at times it was hard to figure out where the trail was. I would have to switch on the CT app and check my positioning more than I liked, therefore draining future resources, but I was in trouble now, so I needed to make sure I was still on the trail. If I were to get lost now, the emergency GPS system would save me, but at a cost of somewhere between \$25,000 and \$60,000 for rescue cost according to what the salesman who sold it to my wife had told her.

As I climbed, more and more obstacles tried to turn me around, stop me, or frustrate me. Trees would be downed right across the trail, and they were at that perfect

height to where there were equal advantages and disadvantages to going under or over them. I tried to compensate for the pack and stay down, and lower for longer when crossing under one of these trees, but each time I felt that I had crossed under 100% of the obstacle it grabbed a hold of my pack and would not let go. I would have to carefully retrace my movement to the point in which the wicked branch had attached itself then like Houdini wiggle out from the straight jacket bind I was in. One time, a branch literally threw me to the ground and I did not want to get up. I was tired, my spirit had been broken, and I just wanted to lay there and give up. When I did get up my emotions would only allow me to take the smallest of steps. I knew it was futile to check the phone for my progress as a blip on the elevation map, I did not seem to move. I adapted a new strategy, I decided to take 500 steps and I would count them. It did not matter how large or small the steps were, I had to get to 500 and when I got to 500 four times, I would check my progress. At 2000 steps the blip moved, so after using this strategy a couple of times I was making virtual progress, and after a few hours, I did reach the top, and proceeded down to a stream. Happy to be free of the detour, but so completely drained and hopeless and wondered if there would be more segments like this, or even worse.

As I rounded another hill, I saw a hiker preparing his camp. He told me he was moving up the hill to a better site that was bigger, because his children were coming up to join him, and he had found a more suitable site that would accommodate more people. He asked if I wanted his site, and I was very thankful, and never so happy to see a flat piece of land to set up camp. The site was also nice because it was closer to the only water source for the next seven to eight miles. This night would be the first when I felt nothing, but exhaustion. For the first time I had to contemplate exactly what I was doing. The

technology was not working, at least not like I had envisioned. Public sourcing as a mobile learning source could not work due to the connectivity issues. Finally, I had used two or three of the applications out of about a dozen I had planned on using, but the other apps depended on a data connection, and did not work, or were highly inaccurate without it. I had been so consumed with completing segments, and miles of the trail, that I rarely stopped to learn using the mobile technology. The plan to record audio and video information as I was learning was out the window, because the GoPro system had fried out, and the battery power and storage required to use the iPhone would be too great. The sample of work I did during the pilot studies in no way resembled what was happening now. I realized where I was, and how fatigued I had become, I realized there was no way to reach the distances I had planned on reaching. I had to pull back on some of the milestones I had hoped to accomplish, and refocus myself on the study, and research at hand. I realized that as a participant I was doing great, I had the drive like the other through hikers, and I was beginning to hit a sustainable stride, but as a researcher, I needed to allow more time to reflect and process exactly what happened between points A and B, and did I learn to arrive at the next point by mobile learning, or more trial and error.

One realization was that the first three to five days were the most physically demanding. The first week was my boot camp, and the penance I needed to pay for absolutely no physical preparation for this trip. I read through one of the apps for beginning backpackers one evening on the trail and learned that physical preparation needs to take place at least two to three months before your trip, and that conditioning must include cardio, strength training, and training with hiking equipment. I had done

little to none of these things; I thought it better to walk out the front door as green as possible to better embrace the knowledge to be gained. Over the first several days, I realized what a dumb idea this was. In the last year, I had maybe walked to the coffee shop by work a dozen times, a four mile walk on sidewalks. I had hiked four or five times to test critical equipment, but my longest hike might have been four or five hours. I had never setup and used the majority of my equipment. The first time I carried a fully loaded pack was the first day on the trail. If I had been going out with other backpackers, I probably would have been sent home by now.

My next epiphany was that I needed to begin to structure what I was doing, and create processes to become successful. I had informally begun to create rules for myself, which reminded me to do some things that I had failed to do early on. One unwritten rule was to always fill up empty water containers when a water source presented itself. I had run out of water early on, and had to ration water at other times, because I believed I would reach the next source before running out, so this became a hard and fast philosophy to live by. Other informal rules that I would remind myself of were:

- “Hike my own hike”
- Plan my breaks and keep moving until break time no matter how slow
- Always set up shelter and sleeping quarters before preparing anything else at camp
- Stay warm first then dry

Later, I would formally put these and other rules into my Apple notes app to help remind me of what worked and what did not, plus having rules and procedures helped to become more efficient.

Along with my set of rules, I began to track what had gone wrong, and started to produce a list. I felt that if I could not learn before I made a mistake, and it was impossible for me to learn as I was making the mistake, at least I could go back and see how I could have done something right or how I might improve in the future. I called this reflective learning. My major concern was that I felt as though I did everything wrong, and so everything would become reflective learning, and that probably made me an outdoor idiot. Whereas, reflective learning would be valuable, and build efficiency, it is not practical in outdoor or survival situations, because of how critical a learning situation can be or become; learning to hug the side of a mountain while traversing a narrow trail with a 1000 ft. cliff on the other side does little after I have made the mistake of falling down the cliff.

The next morning I was up about 7:30 a.m. Every morning I got up earlier than the morning before and for the most part I went to sleep earlier each evening. My internal clock was becoming more synchronized with Mother Nature's clock. I do not exactly remember when it happened, but time took on new meaning as I journeyed over the trail. I would change my pace based upon the positioning of the sun, and begin to scope out campsites depending on the length of the shadows. In addition, I would use differing levels of caution depending on where the sun was in the sky, because I knew subconsciously that the further in front of me the sun was, the greater my exhaustion level, and the more mental mistakes that could be made while stepping over rocks and roots. The days never really became shorter; a day's hike still seemed to take 12 to 16 hours even though only six to eight hours had passed, but the time was beginning to become easier to live with, and less fearful. I began to want to look around, and seek out

those things that had scared me, and filled me with fear; the bears, mountain lions, and crazy strangers.

Most of this day was spent crossing Lost Creek Wilderness, maybe the most beautiful high altitude alpine meadow on the trail. What I noticed about these meadows that stretched for miles, is that they must be teeming with wildlife bigger than the chipmunks, squirrels, and field mice I had become accustomed to seeing. I mean it is this huge field, with a large stream running through the middle, and all kinds of vegetation and great cover for large animals, but I never saw anything larger than a squirrel. This segment was the first time that I felt I had any idea of what I was doing. As I completed this segment, it was physically hard, but only because I ended up overshooting some great camping spots, and went two to three miles further than I needed to.

As I climbed through the meadow, I could see the family that had camped ahead of me the night before. About three hours into the hike, I caught up to them and we all introduced ourselves. They had come to meet up with their dad, who had started hiking at Waterton Canyon, and they were finishing the last two days with him, and all leaving at Kenosha Pass. The kids were actually grown adults, probably four to five years removed from college. They were so friendly and really seemed to be genuinely enjoying the time with their father. I left them to rest, and talk, and continue up the meadow. As I walked away, they apologized for their barking beagles but I was comforted by the barking and told them it was nice to hear the familiar sound of dogs again.

The meadow probably took five to six hours to cross, so often time and space are so different when backpacking or hiking, I do not know if it is the proximity to clouds and the speed at which they travel overhead, or the thin air and the landscape, but

everything always seems closer than it really is. I could see that the meadow ended where a group of young pine trees and aspens were grouped. After rounding those trees I could see that I would climb for just a short while before going through a gate, and beginning my descent.

For as wide open and gentle the elevation of the first half of this segment seems to be, the second half is very heavily forested and with a much greater grade of descent. Today, I needed to get out of the wilderness area. I do not know why I felt so different about hiking in the wilderness areas. From the little that I read and from the postings at the beginning and ending of where the trail enters a wilderness area, these are areas that have special protection. You have to camp in designated areas, you must remain on the trail and as far as I can ascertain, the big difference from the rest of the trail is that mountain bikers are not allowed here, also I saw far fewer hikers in general. So again, I hiked, and hiked, and hiked, and hiked, but this long day was different. I had found a stride that worked, I had some rules that built structure, and I was developing a sense of what I coined to be “trail esteem.” I was still reaching too far when it came to the distances I was covering, and on this day I would still not take the time that I needed for learning, and reflection, but I now felt as though I was not totally outside of my element.

Lost Creek Wilderness ends much as it begins, with a stream and again a high plains meadow. A sign notifies me that I am exiting the wilderness, and I feel the prying eyes of my imagined boogiemens also leaving. Right outside of the boundary, I see two great campsites and right next to the stream, but for whatever reason I feel they are simply too close to the boundary, and that the boogiemens might reach across and snatch me up as I sleep. So I begin climbing up yet another mountain in search of a camp site.

Looking at the CT app, Johnson's Gulch is only about a half mile away. Okay, so I climb, and I climb, and I climb, and it is getting late and I am about to break another unwritten informal rule I have made, do not keep going after 5:00 p.m. Well, it is twilight, and I have again gone up another mountain and back down another mountain. I reach Johnson's Gulch and find there is nowhere to camp, so I begin to climb again, but at a snail's pace. After about 500 feet of elevation gain, I look over a group of trees with a semi flat surface barely big enough for my tent, and decide this is my last hope for the night. I set up my tent, throw down my sleeping bag, and choke down a slab of beef jerky with the little water I had left. I am going to sleep good tonight, not! Little did I know, I must have set my tent right on top of the Rocky Mountain Small Critter Interstate. Just after dark it seemed that if there was an animal of any kind, from a mouse to a marmot, they stopped by to rummage through my stuff and sniff at the tent. It seemed as though everyone was invited, and I became a show piece for all that traveled through. I did not sleep well.

In most cases the CT app was extremely accurate, in the case of water sources it really only missed one or two spots, but when the next source is four to eight miles away, this can be a major issue. More times than not, the app did not have many of the water sources listed, and water was in more abundance than it appeared on the virtual map. This season was unquestionably wet. Water was in abundance, and so was the quantity of wet wood. Over and over again, I worked too hard to start a fire to ward off insects, help dry things off, and provide warmth and the comfort, which only a campfire provides. I tried anything I could think of, because if there was one thing I knew, I could start a campfire. I have a lighter that works and toilet paper is a no brainer as an accelerant, so even

though I am not building a fire from scratch, I can make fire, the car campers way. Again, Mother Nature had nothing to do with it. As a matter of fact sometimes I would try to start a fire and even the toilet paper would not fully catch because it absorbed moisture so quickly from the ground. The extreme moisture had also added to the growth of many of the smaller plants and shrubs along many sections of the trail, pushing them out in front of me as I hiked along. This was a bit annoying but; compared to having to deal with wildfires or burn areas, I choose the wet forest.

The next morning, I awoke or maybe just arose from the little sleep I had at Johnson's Gulch. Now I had to hike back down to the stream/gulch to collect water for the hike the next day. With about six miles till Kenosha Pass and about 1,000 feet of elevation gain in those 6 miles, today would be easy as length goes but a tougher hill climb. Through today the power conservation had worked well, but I would still need some answers by the time I took a break this coming weekend. Off again, climbing and descending, climbing and descending, at least three or four times, and each time I summited one mountain, I looked across a ridge to see that there in another to complete.

One of the more disgusting tasks that I had to do backpacking was to dig cat holes in order to use the bathroom. I learned about cat holes from one of the backpacking applications, and I had to dig a hole about six to eight inches deep. I had a small synthetic shovel, but most of the time the ground had too many small roots, so I used my knife to actually cut a cat hole. As I climbed one of the many mountains over this short section, my digestive system decided to move from a gaseous state, to a liquid state without telling me. I suddenly had a blow out on the trail at 10,500 feet; this was a full blown level five emergency. Doing the more intimate form of bodily relief usually requires

preparation: I have to find my knife, uncover and remove the TP from its waterproof bag, dig a cat hole that is strategically placed next to a good anchor such as a solid but small tree or a boulder at least knee high above the ground, and plan foot placement, all while watching for any hikers or bikers that may be passing by. I never considered a blowout on the trail. Backpack flies off, everything below the waist off, in the order that will be the least contaminated. Toilet paper, water, and bacterial wash located and procured, cat hole, wipe, wipe, and wipe, rinse, new clothing, soiled clothing wrapped in plastic, and then in a waterproof bag, and then placed in a special compartment on pack, with my pack back on, then all is back to normal. Now, add be conscious when passing gas to my list, because that was the greatest emergency of the trip so far.

Luckily, I did not run across anyone till at least an hour after this event. When I did, it was a group of accountants from Tennessee. They were so accountant like, with their clean shaving or very well groomed faces, and perfect hiking outfits. They actually came up from behind me, and again I was reminded that I was probably the second slowest backpacker on the trail. We exchanged pleasantries and talked a bit about what they were doing, as well as what I was trying to accomplish. They told me that they had extra stove fuel that they would leave for me at Kenosha pass if I needed it, because they would be headed back to Tennessee at that point. After meeting them I began to notice a profile of the types of backpackers on the Colorado Trail. Up till now, I had met two profiles of people on the trail, those who were through hikers, they traveled alone usually were males. The others who were trying to cover some distance over a week or so were families, couples, or friends but they were never through hiking.

The further I preceded the more familiar the landscape began to appear. Not the location, but the trees, the dirt, and the types of flowers, even the smell changed and became something I knew from memory. My dad has a cabin down in South Park, which is a giant valley that begins after Kenosha Pass. He has owned this land since I was a baby, and I could probably be blindfolded with nothing but my sense of smell, and I could tell when I was in the South Park Valley. One other characteristic is the cold. It is not like any outdoor cold; it has this humidity to it, so that when it's 35 degrees, it feels more like 25, but when it is hot, it is a dry dusty hot, like in a dust bowl western. You feel parched and dirty when it is hot. The smell of the pine is much more enhanced, and the mosquitoes are far more aggressive. Everyone who lives up here throughout the winter seems to have some degree of "Jack" during the winter scene in "The Shining." Most do not make it, but a couple of seasons. As I proceed, I begin to hear the sound of cars and trucks climbing or descending the pass but the blip on the screen still says I am more than two miles from the my destination, so I must press on.

After rounding the third summit of the day, I began the last trek towards Kenosha Pass. During this time on the trail, I began to wonder how I would develop the narrative for this study, and I started to imagine a three act play, where the first act was labeled debacle, but because the next two acts were yet to play out, I did not really know if the debacle would continue. I did know I needed to fix my power issue, and look for or discover more applications that worked without a data connection. As I passed the last grove of aspens, I could begin to see cars pulling into the Kenosha Pass campsites. I turned on my phone and it just begins blowing up with alerts and text messages that had been held in purgatory until this moment. This area of the highway now has some phone

and data connection. In the recent past this connectivity was not available in South Park because the residents did not want ugly phone towers wrecking the landscape.

As I entered the parking area, I was greeted by the group from Tennessee. They were headed to Fairplay for some food before heading back home. I had a great need for toilet paper and would only last one more day without it, so I asked if I could hitch a ride into Jefferson, a small town with one general store, a mobile BBQ place, an independent gas station, and two churches. It was about seven minutes down the road, but at the bottom of the pass. They were happy to stuff me in their rented Dodge SUV, and I was thrilled at the idea of possibly getting something warm to eat.

Inability Discussion: The Researcher's Analysis of Act I

Act I Analysis Introduction

John Dewey's views on education fit well with how outdoor education outcomes may originate and how learning may be significant in regards to experience, "Dewey (1938) suggested that learning occurs as a result of problem solving in authentic environments faced by the learner, where education is the changing of behaviors through experience" (Martin & Fleming, 2010). In Act I, the theme of "Inability" emerged because of unrealized expectations and my inexperience that led to learning more by trial and error than formal mobile learning. From the beginning, I had made what I thought were reasonable assumptions based upon limited experience and two pilot studies that varied in scope. Act I had the greatest number of experiential learning experiences compared to the following two Acts. During the experiential experiences the iPhone became the teacher or mentor, augmenting the learning events that I participated in, and using some features that are only available on such a device, "Some of the functionality

of current smartphones even surpasses in some ways what is available on laptops, as many include GPS chips, accelerometers, compasses, high-resolution cameras, and proximity sensors.”(Godwin-Jones, 2011, p. 3). These experiences built a foundation for Vygotsky’s scaffolding which allowed for learning to take place in real-time, and through each experience new knowledge was gained in order to progress at an increasing pace with the iPhone as facilitator. With the iPhone as facilitator or instructor success was perceived greater than if I had tried the experience without assistance, Vygotsky (1978) found similar instances in children’s education, “Over a decade even the profoundest thinkers never questioned the assumption; they never entertained the notion that what children can do with the assistance of others might be in some sense even more indicative of their mental development than what they can do alone” (Vygotsky, 1978, p. 85). Because of the broad spectrum of experiences and the ultimate failures followed by the actions I had to take in order to continue with the study, the experiential events in Act I were greater in number and very basic. This was the reasoning behind the title of Inability. At times, I believed that I was incapable of learning what was needed in order to continue, but through the resources that the iPhone and apps provided I was able to construct the knowledge, and piece by piece, the confidence to carry on. Without the smartphone as facilitator I believe I would have failed, “if a person does not believe that he or she can learn, he or she would not. Learning requires conscious attention, effort, and ‘time on task’” (Kolb, & Kolb, 2009, p. 304).

Physical Condition

In the beginning, I found that there was a disconnect between what I thought I had learned and reality. This would change as I experienced learning situations in real time

with my iPhone and apps as a tutor similar to Vygotsky's scaffolding, "Vygotsky asks if student accomplishments while under instruction might be better markers of their potential intellectual growth than their unaided accomplishments" (Nordlof, 2014, p. 55).

I learned how to pack a backpack from a diagram posted on Pinterest, "a tool that has great potential to enable educators to capitalize on the visual aspect of teaching" (Hansen, Nowlan, & Winter, 2012, p. 7), but the pack was too heavy and not adjusted correctly. Without having experienced the pack weight and only using surface knowledge, or knowledge gained through reading a diagram on Pinterest, I did not have the comprehension needed for a successful fit or idea of proper weight of my backpack. Even though the items within the pack were safe, or at least safer than random placement, the items were placed in a way so as not to cause discomfort by poking me in the back. I still struggled with the weight of the pack, and the way it was oriented on my back. It took about one week to make the proper adjustments, and get the weight to a point where it was comfortable. The lack of learning had less to do with the information that I had gained through Pinterest, and more to do with my inability to know what to look for, for example, I did not explore the concept of how a backpack should fit or the optimal weight I should be carrying, "The energy cost of load carriage increases progressively with higher load mass, walking speed and surface grade" (Liu, 2007, p. 755).

Connectivity

The rural or mountainous setting in which this study was conducted did not allow for continuous connectivity for cellular or data information, "A lack of infrastructure to support these power and network-hungry devices can limit their usefulness in rural environments and potentially reduce adoption" (Heimerl et al., 2015, p. 40). After the

first day any applications that were fluid or connected either did not work or interpolated information. The second issue was greater than the first because a navigation application operating through a data or cellular connection would not have a way to track my progress until the next connection was made. This would show on a mapping screen as a straight line between connection points and any movement other than straight was not recorded, so even though I may have traveled two miles east, then three miles west, then one mile east, the application may only have seen my north to south distance not taking into account the actual distance covered, “moving objects and DEMs (digital elevation models) are specific instances of a broader class of complex spatial data that require the interpolation of values from collections of samples” (Grumbach, Rigaux, & Segoufin, 2003, p. 664). Basically, without enough reference points the App needs to makeup the intended path. This becomes an issue if the same application is calculating calories burned or resources available between connection points. While researching app reliability, Nicholas, Larsen, Proudfoot, and Christensen (2015) noted “with only a third of information apps citing their information source, users are denied other important information by which to make informed judgments about an app’s robustness and credibility” (p. e198). The other issue with fluid applications that are non-connected is that they resource information through the connection. If suddenly I had a need to know how to sterilize water and I clicked on this link in the application the information may not be forthcoming due to no connection. This could make the application more of a danger than a savior. Currently, most governmental agencies are concerned with privacy in regards to applications, especially in the healthcare industry, “With the advent of apps, especially health apps, it is nearly impossible to keep personal preferences and medical

history private, as technology has created an alarmingly transparent world” (Flaherty, 2014, p. 440).

What became evident early on was that the static applications or those which did not need or have a data or cellular connection were much more useful in this environment. These applications were basically downloadable PDFs that I could use as a manual for the outdoors. Actually, some of the applications were just converted PDFs of manuals that had been used over time, for example, the U.S. Army Survival Guide. A huge advantage of using these applications was that I could store thousands of pages of information on the iPhone and reference information quickly, “The appeal of apps for consumers rests in their ability to store reference information, save critical data, perform complex calculations, access internet-based content, and present video and audio media, etc.”(Payne, Wharrad, & Watts, 2012, p. 3136).

In addition, I could make comparisons of similar information between applications to confer that I was making the right decision when needed. This was a huge relief when it came to educating myself on the emotional factors involved with outdoor survival and operating alone in the wilderness, “A key ingredient in any survival situation is the mental attitude of the individual(s) involved” (Underwood, 2011, p. 2-1).

From the outset, I believed that there would be connectivity issues that would not allow all of the applications to be connected or fluid at all times. Cellular and data coverage is very limited in the mountainous areas of Colorado. For the most part, coverage is limited to the more populated areas.

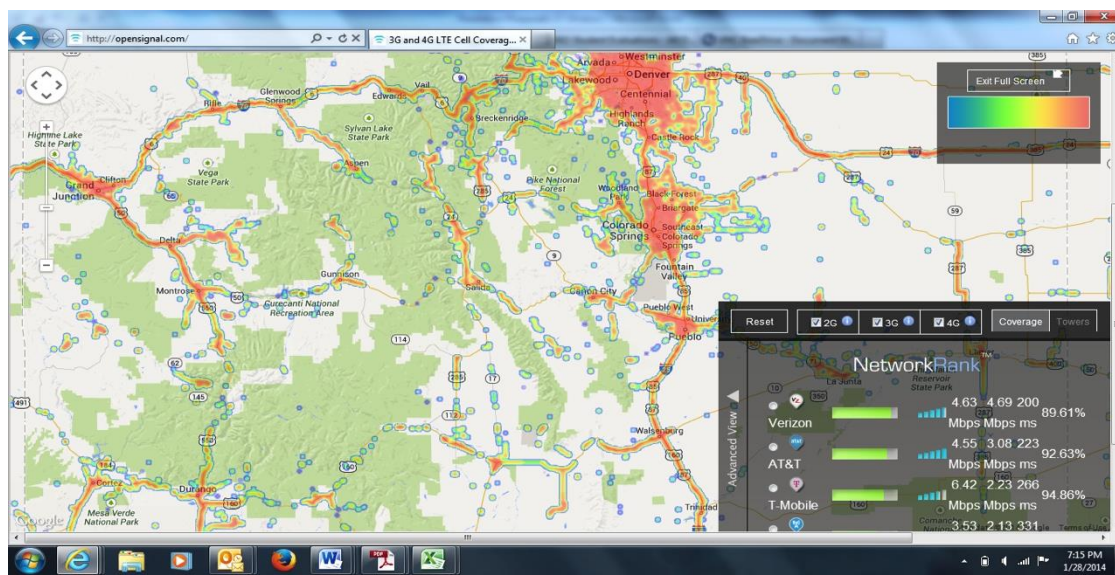


Photo 13. Cell Phone Reception Denver Metro and Southwestern Colorado. OpenSignal (2014). Retrieved from <http://opensignal.com/coverage-maps/>

This map is a sample of what most cellular coverage maps looks like, and was the most comprehensive, for most of the major carriers, and their different levels of service. In theory, I believed that service would diminish from the Denver Metro area moving out, with coverage being the lightest during the most southwesterly segments of the study. From my narrative one can deduce that the phone and data coverage was much less consistent than I could have imagined, basically only providing reliable connectivity in or close to very near larger urban areas, “a carrier publishes maps showing coverage in a certain geographic area, a subscriber may not be able to complete a call due to limitations in *topography* (the surroundings)” (Federal Communications Commission, n.d.). Coverage also played a crucial role when apps were synchronous, meaning that there is real time interactivity for gaining and learning information. Many of the physical activity applications such as “MapMyHike” and “Runtastic” had intermittent loss of connection,

so the application had to interpolate my activity the best it could. In the end, the information recorded was inaccurate, and could not be counted on as a tool to learn or use to adapt for learning situations. Kerr (2016) explained adaptive learning purpose is “to generate a personalized learning experience” (Kerr, 2016, p. 88). With the information being incomplete or non-existent, very little of what these connected apps could offer could be personalized or tailored to my needs.

Connectivity also played a role in regards to public sourcing of information, not allowing for real-time interaction. Most of the feedback was subject to time lapses due to a cellular data connection, and my phone’s ability to access Facebook, which was the primary social networking application that I was using. The idea for what I have coined “public sourcing” using Facebook came from the use of social networking sites or SNS during the Arab Spring. I read about how information was being shared via Facebook among people with similar interest which in turn caused a revolution. Mansour (2012), while explaining the importance in the role of SNS also explained that according to Boyd and Ellison (2007), “the primary purpose of these sites is to connect people, based on common language or shared racial, sexual, religious or nationality-based identities, shared interests, political views, and activities” (Mansour, 2012, p. 129). I believed that a similar form of sourcing could be valuable if I were to have subject experts, and was able to interact with them over Facebook, either in real-time or asynchronously. Unfortunately, this was impossible to test because of the connectivity issues.

Power Management

In Act I, I relied on the illusion that technology would play a greater role in my ability to function in an outdoor environment. What I came to realize was that even

though I needed the information stored on my phone and the CT app to navigate through the terrain, the more I relied on technology, the greater my chances of failure, “Practical barriers to smartphone use have also been recognized including: cost, availability of technology, effective monitoring of use and problems of synchronization with alternative resources (Payne et al., 2012). This was proven when my power source began to fail, and I had to adapt a new strategy to keep my mobile technology running with limited power resources. The failure of my Go Pro camera meant that I needed to adapt a new way of recording and storing information, and writing my field notes using iNotes. iNotes has been adapted to assist in much the same way in the medical field, “iNotes is a data-aware system and inherits relevant clinical information to assist in the generation of daily notes” (Lazakidou & Iliopoulou, 2012, p. 42). In addition, I needed additional assistance of a GPS system for communication, emergency response, and to supplement my wearable technology. In hindsight, even though I was a novice backpacker with little to no experience, my ability to adapt and seek solutions was experiential, but also instinctual in nature. Old foundations of knowledge helped to establish survival and educational sustainability for this study, “In accordance with Vygotsky’s zone of proximal development, the scaffold should provide just enough information so that the learner may make progress on his or her own” (Hogan & Pressley, 1997; Raes, Schellens, De Wever, & Vanderhoven, 2012). With the supplementary apps and the iPhone as facilitator, I was able to use what was available, iNotes as a tool to overcome the problem of failure in regards to how I was going to record field notes.

I had portable solar charging panels that I have attached to the back of my pack, which I considered to be wearable technology, “The subsequently increasing demand for

lightweight, highly flexible, stretchable, and washable power modules is essentially one of the critical challenges for the progress of wearable smart electronics” (Pu et al., 2016). While conducting two pilot studies the panels did not keep the iPhone fully charged during use, but the conditions in both studies had been conducted with overcast skies or during rainy weather. The panels did slow the use of the battery, and I estimate that the panels in direct sun slowed battery use by 20% to 30%. While overcast or in cloudy conditions the use of portable or wearable solar panels was negligible at best. One tactic that was learned from the study was to ration the battery power of the phone, especially since the phone could not be “connected” all of the time.

According to John Higgins, solar product expert for REI, it is important to charge portables devices through an intermediary “supply chain” having the power source connected to a rechargeable battery, then to your personal electronic device, for example, iPhone. The reason this is important is because solar panels are not stable and may increase and decrease power depending on conditions. So in the supply chain, at a minimum there should be a power source (solar panels), power storage (battery pack), and power use (device). The device must be rechargeable, and must not require much more than a 5 volt output rating. iPhones, MP3 players, and other handheld devices fit in the 5V range, while iPads will be in a 12V range, and laptops 24V range. If the output of the battery is lower than that of the input of the device, then it is possible to actually drain the battery of the device faster.

Psychology of Loneliness in the Outdoors

The greatest challenge in Act I was the stress and loneliness of my time on the trail. I did not consider this factor, nor was I prepared for this element, “The greatest

enemies in a combat survival and evasion situation are fear and panic. If uncontrolled, they can destroy your ability to make an intelligent decision. They may cause you to react to your feelings and imagination rather than to your situation” (Underwood, 2011). The knowledge gained through the information described in the static applications helped to reinforce the idea that this was a natural feeling in my situation, and that learning to build a strong mental attitude, and not to allow stress to turn to distress was key to a successful outcome. Once I was able to take on this mental approach, I was able to create and harness new mental fortitude and develop processes adapting applications to help me fight fatigue and anguish, for example, using the idea of taking so many steps before checking my progress on the CT app, which allowed me to see progress on a virtual map and helped lighten my spirits, “Emotions have been identified as powerful influences on teaching-learning relationships,” (Schutz & Pekrun, 2011).

In relation to the Pinterest experience, I was able to fully contemplate the idea of protection from wildlife, and explore options that better suited my situation and beliefs, “Pinterest is an effective way of providing a range of learning resources” (Pearce, & Learmonth, 2013). I did learn through the use of YouTube, that bear spray was a more effective form of protection as opposed to a gun. Even though I never had to use the spray, I felt comfortable with the idea of using it, and that it would deter bears and any other danger posed from most animals or even humans.

Applications

Reliance on information gained through mobile learning in an outdoor situation is key to the success of outcomes. One area that proved to be challenging especially during the First Act of my study, was my reliance on the CT app for providing accurate

information regarding water sources. Overall, the application mapped accurate water sources, but early on I either had a hard time identifying these sources, or they did not exist where the application pinpointed them on a virtual map. While the CT app works accurately from GPS in an outdoor environment where wireless networks or Wi-Fi are not available, resources may no longer be available based upon the environment, “geolocating resources is not enough to support learning activities where students explore and interact with the outdoors physical environment practicing insitu related knowledge and skills” (Santos, Hernández-Leo, & Blat, 2014, p. 17). With early failures in locating water, I had to adapt a new strategy that allowed me to keep more water on hand, more frequently in case I was unable to locate the resources mapped on the application. This involved stopping more frequently to add water when un-mapped resources were available, and to drink more water when the unmapped resources appeared.

One of the greatest downfalls of the first Act, but also one of the greatest learning outcomes of my study, was the variable of time and distance, and how I perceived progress in both a virtual and natural world. In Act I, I became engrossed with the idea of accomplishing the next milestone as it related to segments along the Colorado Trail. This mentality pushed me not only to complete sections because that is how they were mapped on the application, but I also believed that this was how one would succeed in this situation. During the first week, I had established the belief that distance equaled successful learning outcomes, and for most of the time I pushed myself as a participant, and did not allow myself to reflect like I would have liked to as a researcher, “As a practice, experiential education prioritizes active learning components, frequently uses reflection activities as a tool to develop further meaning” (Furman & Sibthorp, 2013, p.

18). My representation of progress was that of accomplishment in distance, rather than the quality of data I was trying to capture. Here are some of my unrealized expectations:

1. I would be connected to phone and data service at least 30% of the time.
2. My power system would provide 100% of my needs allowing me to have access to the technology I was carrying for mobile learning to take place, as well as the technology needed to record events.
3. Facebook followers would actively engage regarding public sourcing and information or knowledge of outdoor education.
4. I was physically and mentally prepared for this study.
5. I had the right equipment and supplies, and was prepared to use them at an entry level.

Adaptive Learning

I began to establish informal rules or thoughts that I would try and remember each time a similar situation seemed to be approaching, for example, nightfall, and when to setup camp. In order to prepare for camp, I would need to remind myself that I would need to begin looking for a suitable site at least two and a half hours before dusk. As I established more informal rules, I began to formalize them by writing them down in iNotes, an application for note taking on the iPhone. I believe this helped to reinforce certain behaviors and also establish thresholds for future situations that had not been encountered before. “Goal attainment will be a function of the interplay between a decision maker's goal-directed behavior and the facilitating and inhibiting conditions in the goal setting” (Bagozzi, 1992, p. 196).

One adapted idea that I had brought over from a pilot study that I had performed was of photographing plants in order to use the photos to study if they were edible. At times throughout the study, I photographed not only plants, but also animal scat, and prints for later identification. I never really found the time to use my mobile applications for identification or when I did have time, I was distracted by other things. Reflecting on my experience, I believe that this type of adapted learning would be extremely valuable especially in pure survival situations. Having the ability to capture accurate information such as plant or animal species for later analysis could be beneficial, if needed.

As I succeeded or failed with each new situation, I found that I sometimes had options. I also found that where several options may lead to successful outcomes and some options were more efficient given my circumstances. Based on Kolb (1984), I would be a Diverger in these situations, “Diverger’s prefer to approach learning through Concrete Experience (CE) and to process it through Reflective Observation (RO). Divergers are best at viewing existing situations from many different points of view” (McCarthy, 2010, p. 133). For example, when I began I could have sterilized water three ways: I had a filtration system known as a Life Straw, I could also boil water, or I could use the purification tablets that I had brought along. The Life Straw is like drinking a beverage through a broken straw, and took some effort. Boiling water was time consuming and sometimes meant transferring the liquid in a two-stage process in order to transport it. Using sterilization tablets was quick and efficient, but created some intestinal discomfort. After using the three methods, I came to realize that the most efficient sterilization process was the tablets and the discomfort was less troublesome than the side effects of the other methods. In this instance, my experimentation would align more

closely with Kolb's Converger learning style in regards to experiential learning, "converger also approaches knowledge through abstract conceptualization however the converger favors processing it through active experimentation" (McCarthy, 2010, p. 133).

CHAPTER III

ACT II--COMPREHENSION

The narrative voice from the participant's perspective.

Comprehension

Arriving at the general store, I thanked my newfound friends from Tennessee, we said our goodbyes, and they wished me luck with the rest of my journey. I set my pack and trekking poles down outside of the general store and proceeded in. The Jefferson General Store has a small kitchen where they serve burgers and some breakfast items. I ordered a Reuben. They also have fudge made right there and it is pretty darn good. I think I ordered the praline fudge. In addition, the store has a little bit of everything you might need. Like one of everything you might find at Wal-Mart, packed into about 800 square feet. The staff is very friendly, and they like to provide customers with whatever information is needed. A new addition to the store, was a seating area that seated about 10 people. They also had added Wi-Fi, so everyone that lived within a 10-mile radius of the store seemed to stop by to check email, or do whatever these folks did with Wi-Fi. With that said, let us just say the connection is extremely slow.

I really could not take advantage of the Wi-Fi, because of my power situation, and at the time, I did not think of buying an outlet adaptor. My Reuben comes to the table and it is the most amazing meal ever. I decide to buy some hot dogs and mustard to extend this great feeling of food that is somewhat familiar, and will be warm once it is cooked. While

dining at one of the available seats, I met a gentleman by the name of Steve. Steve is a local painter, and because of all of the recent rain, he has been held in check waiting for the weather to break. We strike up a conversation about what he does and what I am doing; Steve prompts me to ask folks leaving the General Store for a ride back to Kenosha Pass. I wait outside for people exiting the general store and ask if they are headed my way. No one seems to be going east. After about 30 minutes, Steve comes outside and tells me that the Jefferson lakes campground is only about six miles north of the general store, and that I might be able to catch a ride up there while I am walking that direction. With the day getting shorter, I decide this is probably my best option. The Jefferson Lakes Campground is only about 4.5 miles from Kenosha Pass, and it is where I would have ended the day if I was backpacking from the pass. As I begin the hike up to the campground, the weather takes a turn for the worst with high winds and sleet. Unfortunately, no one seems to be headed this way either. About a mile into the hike, I hear a car rumbling up the road and turn around with my thumb out. The car slows, and I notice its Steve. He shouts "get in, I will run you up to the campground." I could not have been more relieved. After crossing heavily pot-holed pavement, then rutted dirt roads, we arrive at a pay station for camping. Steve knows the forestry lady working the booth, and she lets us pass without a fee. The road up to the campground is moderate at best. No low profile car could go up this road, and we come across several deep puddles where a 4X4 would be the only option to continue on. Towards the end, we cross a river that is about 18 inches deep, and the uphill climb most certainly needs 4-wheel drive. Steve stops the jeep that he had borrowed to bring me up here and says "well that's as far as I can go." I hop out, check the CT app GPS, and notice that I am only a few hundred yards from the

trail. I thank Steve with extreme gratitude as he turns his borrowed jeep around and lumbers back to town.

Hiking up I notice several great campsites. There are a few that are beginning to fill up with families that are coming up to enjoy Labor Day weekend. My first task was to locate the trail, and then look for the most secluded, but functional campsite I could find. I find a great site about 25 yards up from the Colorado Trail and begin to set up camp. By now the sleet and winds have subsided, but they left a damp coolness in the air. A chill I had not encountered before with the feeling that, old man winter was looking down upon me. The day had been very long and the stress of getting back to the trail had added to my exhaustion. I knew I would be resupplying the next day, and taking a day off at my father's cabin, which was a structure with a bathroom, but little more. I set up camp then again tried to start a fire. Everything is so wet; I reached for more toilet paper to try to accelerate the fire building process but to no avail. As a matter of fact, I realize I had forgotten to buy the very thing I went down to the general store for, toilet paper. I now was rationing one necessity until I could resupply.

After setting up camp, I decided to look at another backpacking app. I did this on my Apple 4S back up phone that I kept on airplane mode. Again, this was a static app so it did not pull too much power. It was not connected, so it became a PDF on the phone. The app I choose was the Columbia backpacking app. I wanted to learn more about starting a fire, especially in these wet conditions. I learned that in my case, I really needed to find dry kindling, that was easy to light, and I would need an abundance of it to help light the larger moist sticks and logs. They suggested dry grass, wood shavings, or bark. I searched for all of these items. I found that if I came across fallen tree sometimes

the underside of the tree was protected from the moisture. This allowed me to pull bark that for the most part was dry. One thing I had learned from my earlier attempts to start a fire was that the fire pit needed to be absolutely dry. Any moisture would quickly be absorbed into whatever dry material I was attempting to light. So I dug out the pit and put the wet material around the outside, getting the inside as dry as possible, I placed the tinder in the way I was instructed, and after a few attempts, I had started my first small fire. I then scrambled to find the driest sticks and small logs within about a 50-yard diameter of my camp. I was successful building what I would call a good cooking fire for my hot dogs. Now my only issue was that I really was not that hungry.

As I prepared for sleep, one thought that sort of bothered me was that I had skipped 4.5 miles of the trail with the excursion to the general store, and the ride up to the Jefferson Lake Campgrounds. With this in mind, I decided in the morning to hike back to Kenosha Pass then back here to my campsite. I really had nothing else to do because my wife was coming up the next day for resupply and with answers about the power problem. The morning rises, as do I, my internal clock now synchronized with the rise and fall of the sun. I re-stoke the fire and swallow down at least four hotdogs, maybe five. Hunger was never an issue; it was the taste and internal feeling of real food that was warm. I could feel the warmth run down my throat and into my stomach, but it seemed to continue into my legs, arms, and head. Probably more as a psychological comfort, it made me feel civilized again. After a satisfying breakfast, I decide to leave the camp setup. I would be back here anyway, so I decided to pack light taking my pack with the water vessels, all technology because it would end the trip if stolen, and a protein bar. To be honest, this trip was more than just retracing missed steps, I had run out of toilet paper,

and even though I had learned about natural forms of TP through some off the wall applications, I was not quite ready, and had not positively identified the exact plant(s) needed for this type of operation. Therefore, I decided that while at Kenosha Pass I would take advantage of the facilities and maybe borrow a day's worth of one of the most valued items a backpacker can carry, toilet paper.

For the first time, I decided to hike while listening to music. I had downloaded 129 songs that I felt were specific to this trip, but up until now, I had yet to listen to any music. I had the songs on both the iPhone 4S and 5S, but because of power limitations, I had to use the 4S in airplane mode. I was interested to later find out that after listening for about 4 to 5 hours the phone only drained about 1% of its power. Right from the start, the music changed everything about my hike. My energy level went way up, I moved at a much faster pace, I would actually kind of 'hike-dance,' and I had all of these ideas about what I was doing rushing through my head. It was the first time that I had been on the trail and able to think about anything other than the trail. One down side to listening to the music was that this was a highly trafficked area with mountain bikers; they would come up behind me, and I had no idea they were there. I would just keep be-bopping down the path like Dorothy in *The Wiz*. When I finally realized I was holding people up, I started looking back every so often and even went to listening to music in just one ear. Another interesting thing that happened was an emotional change depending on what song played as songs shuffled through the play list. I had chosen some songs to remind me of family, and some to motivate me based upon my environment.

Rocket Man by Elton John was one of those family songs that when it came on I just lost it. I felt the sadness rush up from deep inside and rise to my throat into my

sinuses and through my brain. The feeling is like after swimming and getting a little too much water inside my sinuses while exiting a cold pool. Kind of a hard sensation on the nasal passage, but when complete, a bit refreshing. My theme song became Hitchin' A Ride by Green Day, maybe because of the tune, but to me it seemed to be a song that was a tribute to vagabonds, and all of us through hikers had some vagabond in us. Some of the artists that really seemed to fit the mainstream moments on the trail included Led Zeppelin, The Doors, Jane's Addiction, The Eagles, Foo Fighters, Jimi Hendrix, Lou Reed, Red Hot Chili Peppers, and for some weird reason Big Data. Using the iPhone-iTunes app to listen to music benefited my train of thought, increased my motivation, and along with the hotdogs, gave me back some of the humanity that I was missing during the first phase of this journey.

As stated earlier, this portion of the trail is highly traveled. The number of mountain bikers seemed to have tripled compared to the number which traveled on the ever so popular Waterton Canyon portion of the trail. Now this could be more perception than reality given that this portion of the Colorado Trail is single track and so I had to yield to cyclists instead of them passing on a wide service road, but in any case this portion of single track seems to have a much higher proportion of people hiking and biking. As I round one of the last corners before descending down towards the campground, once again I hear the familiar sound of cars and trucks crossing the path on Highway 285. As I come to the restrooms, I notice a group of day hikers gathering. After emerging from the restroom with my newly acquired supply of toilet paper, I am greeted by one of the hikers who asked me about my travels. It turns out that this gentleman of about 55 years of age was managing a crew of volunteers that helps maintain the

Colorado Trail. I spoke to him about my research, and he knew little about the Colorado Trail app that I was using, but liked the idea of researching the technology for use on the trail. We talked a bit about the segment that almost brought me to my knees, and he said they had planned to work over in that area soon clearing many of the obstacles that nearly make it impossible to pass. I thanked him for his work and I was soon back on the trail towards my camp.

Returning to camp, I had more time than usual to reflect on what I was doing and what I had learned. When backpacking, I spent most of the time just trying to reach the next endpoint, searching for water, sterilizing water, setting up camp, preparing food, cleaning up, and then settling in for the evening, so I just did not have time to reflect. With the destruction of the GoPro camera, I relied on short field notes that I had hoped would trigger my memory about all of the important events that took place. I had been participating in the event 90% of the time and researching far less, but I had to come to grips with the idea that this was how it was. Examining every little detail and trying to frame it as a researcher would destroy the experience as a participant. I could have spent three weeks covering only 20 miles and exploring all of the applications I had downloaded, adding others, and communicating on Facebook hoping for information to come back from followers, but that would not have been a genuine experience, and would not have led to situations, or a true representation of what the actual experience would be. I did realize that I needed to begin to raise my level of performance based upon what I had learned, and to become more integrated with the technology that I was using, but only if and when it did not affect the experience as a participant. I also began to look at ways of adapting the technology. I had to become more efficient and raise my level of

experience. I began to make lists using my iNotes application on the iPhone. Where in the past I had begun to build procedures and rules, I went further and established performance standards. One idea was to use my timer and alarm to better establish progress. I could just look at the GPS on the CT app to see where I was, but that led to obsessing over my movement and I would look too often. Instead, I would set an alarm based upon where I believed I would be, and that would trigger activities such as resting, or eating lunch. For water, I began setting my timer at 30 minutes, but realized that this was too short of a time in some circumstances, and that 45 minutes worked well to remind myself to drink. This sounds like a little much, but there were times when I became so focused on my footing, or the weather became so extreme that all I could do was think about reaching the next destination, and I would forget to take in water. I would set a reminder to tell me to make sure to power up or down equipment based on what I was doing and the time of day. One example is that since I was disconnected from the world I needed to make sure my GPS texting system was on at a particular time of day, so I could send and receive communication from my family. Upon reflection of all of these different learned outcomes, I was ready to settle in for the evening. Tomorrow would be a resupply day, and I would get to see my wife. If all went well I might get a shower and one night's rest in a real bed. With all of this soon to be possible, I settled in for another night and to the sound of rain. I have been on the trail for one week.

In the morning, I woke up a bit later than usual, well actually, I woke up at the same time as usual, but stayed in my sleeping bag because I knew it had rained the night before, and it was cold and soggy outside. Probably around 8:30 a.m., I decided to wake up. I had trained my bladder to only go when the sun was out. When I had first started

this venture, I would get up two or three times a night, bear spray in hand. Funny thing about the bear spray, I never saw any other backpacker carrying it, and now I was embarrassed to even have it visible. It made me look like a real novice. Probably around 10:30 a.m., I communicated with my wife via GPS texting. She said she would head up right after work. Her arrival time would probably be around 6:00 p.m., at which point we would head to my dad's cabin and begin working out some of the bugs that had plagued me in the first phase of the trip. We had decided that I would start hiking towards the general store at about 4:30 p.m., and she would meet me somewhere on the road leading to the store. The total distance to the store was about nine miles.

One thing that I learned after talking to many of the through hikers that I met was that most hikers take breaks usually in the major towns that they run across. They usually say that they are going into town to resupply or pick up clothing, but I sensed that we all need a break, and a day or two of downtime becomes healthy for the body, as well as the mind. As I putted around getting water, sterilizing it, drying out from the night before, and trying to get the solar panels to charge the battery system, I met Matt. He was through hiking to Durango, and had asked if I had met or seen another person on the trail. I had not and soon Matt was on his way. He did tell me that he was averaging about 20 miles per day, which was about double my average. He looked like he might just make it.

I am not exactly sure what time I left, but the clouds were beginning to roll in and the wind was picking up, so I made the decision to begin my walk into town. It was probably closer to 3:30 p.m. than 5:00 p.m. As I walked down the road, I noticed that the campgrounds below were beginning to fill up, not with the usual weekend campers, these were big groups with RVs, ATVs, and three to five vehicles loaded with several people in

each group. It turns out that this was Labor Day weekend, and this place was hopping. It is funny the camaraderie I shared with my fellow backpackers. We went out of our way to meet and greet each other, as well as other hospitable pleasantries. These folks wanted nothing to do with a lonely backpacker, and I felt like I was perceived as a serial killer as I passed their camps. I would wave, and maybe get a stern stare and a half wave as I passed by.

Leaving the campgrounds behind me, I approached the fee shack for the campgrounds. I wanted to say hi to Beth, I think that was her name that had been so friendly the day before. A gentleman walked out, I think his name was Bob, he also worked for the Forestry Service, and I told him I just wanted to say hello to Beth. He told me she was on the phone. Bob and I chatted a bit and he suddenly stopped and said, “Oh you’re that guy with the iPhone.” To which I replied “yeah.” Turns out that Steve the Painter had been telling anyone who would listen about my study, and soon word had traveled around that some guy was using his iPhone to navigate the Colorado Trail, as well as learn about the outdoors. Bob and I talked a little bit longer, and the idea of GPS on the phone came up. I told him how impressed I was with the CT app, and its ability to track me along the trail even though the phone did not have GPS. I did not know how it worked. He looked at me kind of dumbfounded and said, “You know your phone has GPS.” Bob was all of 70 years old, and probably never studied iPhone technology, but he knew it had GPS. I just looked at him and said, “Oh I didn’t know that.” Schooled by Bob, a 70-year-old Forestry Serviceman, stationed miles from almost anywhere about technology, how embarrassing. I left with my tail between my legs after a few words with

Beth. Well, if nothing else, I now knew why my phone knew where I was, and I had finally been given my trail name, iPhone Guy.

I walk, and walk, and walk, towards the paved road that will take me to the general store. As I look west, I can see Michigan Hill, that is where my dad's cabin is located. I did not know that it was actually closer than the general store. As I walked, the pack seemed to get heavier and heavier. I am only walking down a road, but my pace seems to become slower and slower. It is very windy, and at times, I partially lose my balance as the wind works hard to blow me over. I am on a dirt road, then pavement, then some combination of both. Trucks and cars pass me in both directions, but I know I have time before my wife will pick me up, so I should not try to hitchhike, or I will just be sitting at the store talking to Steve, and that might be burdensome. I continue on and after about two hours, I can begin to see the signs of the town. It is about 5:30 p.m. and the shadows are becoming longer. I have an awful feeling that my wife is still hours away, caught in Labor Day traffic. Continuing on, I reach the first of the two churches, and I can see the store about 300 yards in front of me. The highway is a constant stream of vehicles escaping from the urban environment to relax on this holiday weekend. As I approach the road, a familiar vehicle rounds the corner, and pulls in on the other side of the road. I am exhausted and smell un-human, maybe what I would imagine a corpse to smell like. My wife hops out and I have never seen her so happy to see me. I am relieved, and feel better now.

She confirms what I was afraid of, I smell horrible. One lesson learned from the survival apps is that cleanliness is extremely important when out on the trail, but up to this point, I never took the time, or found the opportunity to completely bath, something I

noted to correct during the rest of the trip. We stopped by the General Store, and picked out a can of refried beans, queso dip, and chips for dinner. This sounded so wonderful to me! After arriving at the cabin, I noticed that my dad had taken out the toilet. This was no big deal for me, I was accustomed to digging cat holes, but now I had to teach this skill to my wife, who was not that amused. That evening I was caught up on all of the happenings at home, and we made a game plan to fix some of the issues I had during my first week on the trail. It turns out that there was nothing wrong with the power system, I had just misused it. I was not powering down the system when I was not charging, and it took 12 to 16 hours of constant direct sunlight to fully recharge the battery. This was practically impossible because I had the panels strapped to my pack, and at best in open areas the panels were in direct sunlight 25% of the time. In addition, much of the time I was hiking with overcast skies, which made the panels far less efficient. The best thing I could do was power up the battery system, then ration the power over a week's time until the next re-supply, where I would again power up the system. I estimated that this would be sufficient for the iPhone 5S, and in a jam I would have power for the GPS emergency system, if needed.

The next morning we traveled down to the General Store to fix an application issue, and look for a power cord for the GPS system. I had lost the cord somewhere back at the last campsite, and needed it to power up the device. Well, no such luck: One other issue was that the weather was getting colder, and the pants, and extra layers I had packed were not sufficient for the weather. With these two issues, we decided to make the drive to Breckenridge, about an hour away. As we drove, I began to feel a bit under the weather. My energy was real low, and I started shaking from feeling chilled. By the time

we parked the car I was shaking all over and could not get warm. I tried to walk into town from where we had parked, but the shakes began to become overwhelming. My wife became extremely worried, and I realized what was happening. Yesterday, in my excitement to see my wife and return to civilization for a night, I had forgotten all that I had learned about dehydration and the need for water. On a typical day, I would drink 10 to 14 liters of water a day to stay hydrated. Yesterday, I might have had one to two liters of water, and I was very seriously dehydrated. I told my wife that I needed water, and maybe some warm tea fast. We went into a small coffee shop and ordered tea, I was shaking so badly that I could not hold the cup; I spilled the hot liquid all over myself. My wife gave me sips and I drank from my Nalgene bottle. I was in shock, and needed as much fluid as possible. My wife wanted to get me to the hospital, which was probably the right thing to do, but I knew that would end the trip, and I had just found my stride. Instead, I convinced her to let me keep drinking fluids, and if I did not improve, I would go to the hospital. We drove around with the heater on high, and I continued to drink as much water and Gatorade as I could possibly handle. She tried to stop at stores to find what I needed to re-supply, so I could continue the trip, but she could not locate what I was asking for. I was too weak, and cold to leave the car. After about two hours, the chills began to subside, and I gained enough energy to stop at Wal-Mart to get more Gatorade and the other essentials I needed to continue. I was so sleepy from the energy that was robbed from me due to dehydration. While we drove back to the cabin, I realized we had accomplished nothing, and if I did feel better the next day we would need to return. Falling in out of sleep while my wife drove, I knew this could possibly be the end of my journey.

Back at the cabin, we prepared a hot bath, and she cooked up some pasta. I continued to drink as much as I could hold, and although I had little room or desire for food, I forced myself to eat something. Putting on a brave face, I acted as though I felt much better than I was. During the night, I felt as though I might not wake up again if I did not get some medical attention. I finally fell asleep, then awoke the next morning feeling a bit fatigued and sore, but ready to continue. We stopped at True Value in Fairplay, which was a quarter the distance of Breckenridge, and was able to find most of the supplies I needed to continue. I was now a day behind, better clothing would have to wait until Copper Mountain, my next re-supply stop. We had lunch and my wife took me back to the Jefferson Lake campgrounds. I showed her where I camped and where the trail was, and then I was again off on my journey. Watching her drive away brought back that familiar feeling of extreme sadness and loneliness.

Checking the CT app, I knew I would be hiking towards tree line, since I was only one day removed from being so sick, I decided not to push too hard and camp early today. I may have covered 4 to 5 miles before setting up camp and falling asleep. The next morning I was up early, I knew that today would be a very long climb up to, and over tree line, approaching 12,000 feet in altitude according to the app. My physical condition was probably only at 80%, so I knew I would need as much time as possible. One of my rules was not to get caught above tree line too late in the day, and always have time to get down to an area where I can make camp. As I was hiking up, a mountain biker came up behind me. I moved aside to let him pass, but instead he stopped and said not to bother because he had a group of about ten behind him, and he was going to wait for them here, so I pressed on. About an hour or so later, he came up again behind me and I

yielded. This time he passed me, so I kept an eye out for the rest of the pack, but no one ever came. As I approached the empty alpine area known as “tree line,” he came down the hill, obviously perturbed at his peers, but then again he came up behind me and I yielded, yet again. This guy was really getting on my nerves. Finally, at a trail junction, I could see him off an adjoining trail, and now I could have some peace. When climbing or hiking a mountain over 11,800 feet you can run into the tree line. This is the point where there is not enough oxygen for trees to grow. The other thing that is interesting is the force at which the wind blows. It never seems to stop, and it is cold. As I get beyond the trees, I needed to stop and add layers. I was concerned because I was already not feeling well, and I figured with the heating and sudden cooling of my body, I might create more problems for myself. The hike to the top of this ridge was very long, very exposed, and seemed to switch back and forth several times. Each time I thought I was nearing the top, another small hill presented itself. As the wind pounded my body, and the trail exhausted me physically, I finally reached the top. I took a quick picture and began to descend. Right away, a fellow hiker came from the opposite direction. We said our hellos, and moved on, as this was not the place for long conversations. One odd thing though, he was wearing Croc’s, I could not believe it.

I descended quickly, it was already around 2:30 p.m. and I needed to still travel over seven miles to get to my next campsite. I did not want to rush anymore; I had given up on my earlier ambitions to cover 360 miles during this three-week venture. I decided not to contact work, and ask for an additional week off to get to Durango. That would be impossible, at least for me. From the through hikers I had met the most ambitious plans by the most athletic hikers would still take them between five and six weeks for

completion. I wanted, and needed to slow down, to hike my own hike, and really begin to learn more from my applications and from my own reflection. At about 7:00 p.m., I arrived at Swan Lake Road where I had planned to camp. There were still a few layovers from the Labor Day weekend, and even though it was comforting to have others around, many of these fine outstanding citizens liked to set up their own firing range, and discharge their weapons, which constantly made me nervous. Luckily, these folks were somewhat responsible and put their guns away when it became totally dark around 7:45 p.m.

In the morning, I awoke to another soggy camp, with everything being a little damp. My tent is watertight as far as I could tell, but there is a certain amount of perspiration that builds up from my respiration and sweating during the night. This liquid sticks to the top of the inside of the rainfly, and is absorbed into most of the materials within the tent. When it is rainy there is a lot of moisture in the air during the night. The moisture within the tent sticks around and leaves everything a bit wet in the morning. It also adds to the chill early in the morning before the sun can hit the tent. Another reason for the extra moisture is that I have learned to camp near sources of water; primarily streams so that I can make sure to have a good source of water in the evening, and start the day with full water vessels. The small valleys that these streams are set in contain moisture from the stream flowing through, so there is naturally a bit more moisture in these areas. This mixed with the amount of rain that had fallen, and the fact that everything is always wet, adds up to soggy mornings.

I pack up camp, look at the CT app to gain my bearings, and make decisions on how far I am to go during the day, and where I should plan camp at the end of the day. I

notice from the elevation map on the app that I will be climbing over several mountains, hills, or ridges as I approach the town of Breckenridge, but the distance is somewhat short, and this should be a particularly easy day. Probably about an hour into the hike, I saw a young fellow hiking towards me. He had his shirt off and was wearing skater shorts with Keen water shoes, but he had a large backpack like a through hiker. His name was Ryan and he was on his way back to Denver coming from Durango. I believe he told me that he had been on the trail for six weeks or so. He had quit his job and was doing this for the summer. His choice of footwear threw me off, and his decision to go shirtless was a bit weird considering the bugs, but he looked like he had been on the trail for several weeks. He also seemed to look like when he began his journey it was new to him, like it was for me. I wished him well. Heck he only had about a week and a half to go if that. I really admired his decision, and thought about how this experience might change his career decisions in the future. I also noticed that his teeth looked like they had not had a visit from a toothbrush since leaving Durango, and I made a mental note to make sure I was brushing on a more frequent basis while out on the trail.

As I begin to climb out closer to Breckenridge, I noticed a sign for Blair Witch Trail. I remember seeing the movie right when it came out in the Indie theaters, and about how it was portrayed as “real” before it hit mainstream. This made me reflect on my own fears about the trip, how friends and peers told me I needed a gun, and how I chose to buy bear spray. I was also scared of the people I would run into, and just about everything, I would encounter. What I was beginning to understand was a concept from one of the apps that fear can become your greatest threat. Now I have to worry about witches. Anyway, much of what I had worried about encountering did not really register

with me; I actually began to want to see bears, mountain lions, and boogiemens. I began to want to test my fear, my resolve, and the bear spray, but none of those factors would be forthcoming.



Photo 14. Blair Witch Trail. Ivan Nikolaeff (2014).

Up one hill and down the next, I hated rolling hills. I would climb for two hours, descend for an hour, climb for an hour and a half, descend for 45 minutes, and then climb for two hours and back down in an hour. I thought to myself, I cannot hit a stride when there is so much up and down. On one of the ascents, I ran across a group of trail volunteers, probably about a dozen. I was climbing a steeper section of the trail and crossed their path. I thanked them for their work, and they wished me luck with pride on their faces. I really did appreciate the work that these volunteers did because the trail can become so rutted, primarily by mountain bikes. Instead of having a trail that might be 12 to 18 inches wide, the small valley that the bike tires create takes the width down to 4 or 5 inches, which forces backpackers to either walk next to the trail on lumpy ground or in

the valley with each step forced to be in front of the other. The volunteers come and fix these issues, as well as natural erosion.

As I rounded the summit of the hill the landscape really began to change; the trees and ground began to take on an apocalyptic picture. All of the trees that were somewhat mature had been cut down due to pine beetle kill. There was a sprinkle of saplings here and there, but everywhere I looked it had appeared that an atomic bomb had been dropped, and I was a sole survivor crossing a desolate land. I had seen the devastation from the highway, but to walk through the middle of it was amazing in the saddest and most depressing way. With no shade, the sun just beat down and drained my energy. What the sun did not drain, the landscape punched from me.

The day turned out to be much longer than what I had anticipated. I soon rounded the last climb and suddenly I was overlooking the town of Breckenridge. I had no idea that the trail took me into the town. As I descended, I could see it dropped me off in a little neighborhood of small cabins just north of town. I crossed down into this neighborhood and found a river that ran through town. I needed to resupply my water, but I felt strange about doing it here in this urban environment. Once I crossed into the neighborhood, I felt the stares from the citizens. They were not friendly, and they looked at me as though I was homeless, but I was not I had my tent! To stop and take water from the river that ran through town, felt like I might just be homeless, so I decided to wait for the next water source, I broke another one of my rules.

From what I could tell from the signs posted every so often was there is to be no camping in the town of Breckenridge, or near Breckenridge. The area that I came from east of town would not support a campsite because of the steepness, and as I looked at the

CT app and tried to pull information about Breckenridge from my now connected phone, I found that most backpackers actually stayed in town. It is a major hub for re-supply, and lodging for hikers, but I was not prepared to do this. I had little money, about \$40.00, and no credit card, so again with my tail between my legs I crossed Highway 9 and found the trail. As I started ascending Gold Hill, another apocalyptic landscape with no campsite for as far as the eye could see. I was depressed about missing out on the town of Breckenridge and the fun that the other through hikers must have been having.

It was about 5:30 p.m., when I began to ascend Gold Hill. Again, I was breaking a rule (Setup camp no later than dusk), but I had no option. I could not stay in Breckenridge, and I could not camp right outside of the town, so I needed to continue on the trail until I found a suitable site. By 6:30 p.m., it seemed like I had just left the last of the houses that were built on this hill, and I was finally leaving town. Over the next mile, I finally found a flat spot that would work to setup my tent. I did not believe I could find anything better, so I dropped my pack. Before setting up camp, I decided to hike up the hill for 10 minutes just to make sure there was nothing else. I had learned that many times a better site is just around the corner. I set my timer and climbed through the trees that had finally come back into the landscape. When the timer went off, I noticed I could see the top of the hill, and decided a few more minutes would not kill me just to make sure I was not missing out. I rounded the top of the hill and found one of the most inspiring campsites I had ever seen. Well it was not really a campsite, it was a swinging bench that sat at the crest of the hill and overlooked the entire town of Breckenridge from probably 600 to 800 feet up. It was perfect. I scrambled back down the hill, grabbed my pack, and more slowly than before made my way back to the spot with the swinging chair. I set up

camp and then retired to the swinging bench, and looked out at the town for maybe 45 minutes. I was disappointed that I could not go into town, but I was extremely appreciative to have such a great site to spend the night. As the last light fell from the sky, I retired to my tent exhausted from the day but happy in how it had ended.



Photo 15. Rocking Bench Outside of Breckenridge. Ivan Nikolaeff (2014).

I woke up the next morning and checked the CT app for my progress and what the day might bring. I knew it would be another hard day of climbing and descending, from Breckenridge to the Copper Mountain area. I would reach the highest point to date, and would need to hike along a ridge for some time, before a steep descent towards the next resort. Packed up and back on the trail, I climbed for a short while then descended to a stream, where I decided to refuel my water reserves, and have a protein bar before beginning the long climb to the ridge. As I sat there, a few women came jogging by. It seems as though I had stumbled upon a popular trail for trail runners. Within about 30 minutes, another backpacker wandered down from where I had come from. His name was

Theo, and he was a different type of backpacker. He wore camo pants, a tan button down shirt, and a floppy hat that had the brim all the way around it. Theo also had an old army backpack that looked like it was used in World War I. He came right up to me, and we began to talk. This was his third season of backpacking, and from what I could tell, a season for Theo lasted during a four-month period each summer. He was not hiking to Durango, but instead was going to Silverton along the Continental Divide trail. He told me that everything he owned was in his pack, and even though it did not look like much, it was very heavy. He also told me about the fact that he did not use a tent, instead he strung up a hammock, and that he felt it was much more comfortable to be off the ground. Theo was probably about 24 to 26 years of age and very skinny. I wondered what he did in the off-season to support his backpacking, but by the looks of it, he did not need much. As a matter of fact, Theo did not carry any maps or really have any idea of which way to go. He asked me approximately where he was, and I tried to explain where his next direction might be, in order to lead him to his final destination. One last thing I noticed about Theo, he wore a pair of well-worn Tevas, and I was beginning to notice a trend in footwear. After he left, and was a few thousand yards up the trail I decided to begin my ascent towards the summit.

After climbing for about two hours, I came across a great campsite next to a big stream. All along this trip, I kept telling myself to slow down, hike my own hike, and to take in more through reflection, than just miles on the map. I finally decided to take my own advice. The summit could wait another day. I had not had an easy day in some time so, I decided to stop here for the day and make camp. It was only maybe 2:30 p.m., which left several hours for making notes, and further research some of my static applications.

This would also give me time to reorganize and cleanup a bit. I had laundry detergent and body wash, so I could cleanup if the opportunity presented itself, and now it did. I took my time setting up camp, and then read through some of the PDFs in my phone. Next, I hiked around the immediate area, noticing that someone had left a pair of blue tennis shoes behind. Suddenly, out of the trees down by the stream, a familiar face appeared. Theo popped out and came towards me, he was drying off with a rag, and I could tell he had just been down at the river bathing. I was a bit surprised, and for the first time noticed the extremely large knife he carried around his waist. I was not worried, but was a bit concerned because for as nice as this guy had been, his sense of normalcy might not be that balanced. He strolled over and we chatted a bit more, he picked up the tennis shoes and matched them to the bottom of his feet. He said, "I wonder if these will fit, it is always a good idea to have some backups," to which I replied, "I don't think anyone will be coming back for them," and after a few awkward stares at each other, Theo put the shoes down, wished me good luck, and started back up the trail. I just sat there and thought about what had just happened. It was a strange encounter, but more normal than what I could have imagined before I had started the trip. What is funny is that Theo left those shoes on an up-turned log about three feet high, they reminded me of Wilson the inanimate volleyball in the movie "*Castaway*" with Tom Hanks. I did not really talk to them, but we exchanged some thoughts and ideas of what brought us both to this point.

Minutes become hours when alone in this environment. I took my first stream bath, washed my dirty clothes, and hiked around a bit more. I sterilized water, read more from the static apps, firmed up field notes, added info to my rules and procedures in iNotes, and even broke down and played solitaire for a few minutes but the time and

monotony of having setup camp so early made it extremely boring. I knew I would benefit from the rest, and be that much stronger for the hard climb tomorrow, but I was still bored as hell. Later, a day hiker appeared. I had noticed his car just beyond my campsite, and he came over and we talked for a bit. He was an older gentleman, and liked to spend his days in retirement coming up and hiking different trails in the mountains. We talked about my research, and like most, he acted interested but seemed to have this look on his face, as though thinking technology does not belong in the outdoors. He never said that, I just seemed to notice a familiar cringe that was familiar from the others I had talked to. By now, it was about 5:30 p.m., and time became more relevant, as I went into my regular evening duties of preparing dinner, and getting ready for the night. I should mention that by now I had given up on cooking food, now usually having a slab of beef jerky and a protein bar for dinner, maybe 400 calories, if I was lucky. That mixed with two liters of Gatorade that I mixed from powder became the norm for dinner.

The next morning I felt clean and well rested. It was probably the best I had felt during the entire journey. My mind was in a good place and I was physically ready to hike almost any place, so I began the long slow ascent towards the summit. Soon after leaving camp, I looked to my left and saw a backpacker just waking up and getting out of his tent. He saw me and we started a conversation. His name was George, and he was through hiking from Durango. With the issues that I had finding a suitable campsite in Breckenridge, I inquired about the sites in or near Copper Mountain. He said that signs were posted everywhere that camping was not allowed, but that he had hid in the trees right above the Frisbee golf course for six days, and no one bothered him. He was not a bum, and as a matter of fact looked pretty well put together, but the idea of hiding in the

trees and camping there seemed funny to me, like a vagabond. He also told me about the best happy hours, and where to go in town. Copper was my last layover and resupply stop. My wife, and this time my kids would be joining me for the night. I would arrive today, but they would not be up till late tomorrow. I thanked him for the information and began my climb again.

Hours went by, I passed through the trees at some point another hiker came towards me. He was a much older version of Theo, and just the nicest guy. I think his name was Phil and we exchanged the usual pleasantries. He told me he was headed towards Gray's Peak, and that he had been on the trail for some time. He really looked like it, with a long black beard, and a much-wrinkled face, we had a laugh or two about something, and he told me his sister was going to pick him up in a week or so. He made me remember Bill who I had met at the beginning of the trip, and I wondered how he was fairing. I so wished to see him again to talk about the adventures he was having. I did learn at one point when talking to some hikers earlier in the trip, that Bill was going around some of the more difficult areas, and I can confidently attest that was a very good idea. As I left Phil, I wished him good luck with the end of his journey and he wished me the same.

As I climbed closer to the ridge, I had to take more breaks due to the long hike, but also due to the elevation. I stopped at the top for a quick picture then started my hike across the saddle before approaching the ski area boundary of Copper Mountain. As I crossed the saddle, I could see some of the resorts highest lifts, which were receiving maintenance in preparation for the approaching ski season. It took approximately one and a half hours to cross the saddle and make the final approach to the highest point where I

would descend from. As I came to the point where I would make the final push to the top, two hikers came over the top and greeted me. They seemed to have the same urgency I had when beginning the crossing so we said our hellos, and they told me that I was almost there. As I crossed over the summit, I looked down, and saw a man with a walking stick about a quarter of a mile below me.

The descent into Copper Mountain looked very steep on the elevation map of the CT app, and I could swear it lived up to its virtual representation. As I approached the hiker coming up the trail, I noticed that he carried very little, just a daypack, and minimal clothing. His name was John, and he was from Lakewood. I guessed his age to be between 70 and 75 years old. He carried an old lacquered walking stick and was slowly making his way to the top. We talked for a while, and he told me that he had hiked this entire trail 25 years ago, but now he just came up for day hikes. He pointed out Mt. Holy Cross and told me that I should be headed in that direction. He also told me a story of a dentist who had gone on a day hike with his wife and before they reached the top, she had become tired and he told her to stay and wait for him to come back. When he arrived back to where she was, she had vanished and this set off a huge search and rescue attempt. Seven years have passed and no one has found her body yet. He also pointed out the molybdenum mines, and said I would pass close to them. Their tailing ponds were huge and had the most beautiful turquoise color. I wondered what toxins I would be drinking from the streams that came down from the mines. John's last words felt a bit eerie to me he said, "Well I better be on my way, I am headed to the top to eat my sandwich, and take a nap." The top of a summit is very formidable, I would not sit and eat a sandwich and take a nap. It felt like John would not be coming back down, ever.

I met tree line again, and I cannot describe how steep the trail was at this point. Gravity did much of the work of hiking, but the tendons right under my knees were screaming. For the first time, I really understood the risk of a misplaced step. One loose rock or slip on gravel, and I could be done. With that said, I again was focused on each and every step and it was not until two hours later, and about four miles into the descent that the slope of the trail began to ease up. Maybe another hour and a half passed, and I approached a stream with a bike trail crossing it. I learned my lesson in Breckenridge, so I tossed off my pack and began to fill my water bottles with the pedestrian walkers and bikers looking at me as though I had no place to live.

The signs for the CT trail signaled that I should continue up this paved bike path for about a half a mile then cross the highway and continue on. I hiked up the path noticing that there were tents set up to my left where the stream ran through. A resort was to my right. These were not any backpacking tents; these were large double room family tents. I really did not think much of the camping area, but decided that maybe I should go down there and look for a spot. I decided to go up, and cross the highway into the resort boundary just in case there was a camping area that I had missed. Once back on the trail on the resort side I noticed that the trail took an immediate turn to the left, and it looked as though it climbed back up Copper Mountain. Since it was towards the end of the day, I decided it would be prudent to head back to the stream and camp there overnight. Besides, it started to drizzle, and this could turn into a real storm. In the drizzle, I set up camp. When I took everything out of my pack it got a little wet, and with the humidity being so high it never really dries off, but I persevered to get everything settled. With that accomplished, I decided to walk into town, just for something to do. This time of year

Copper is a ghost town; most of the people in town are preparing for the ski season with the exception of a special event or two. I walk around trying to get my bearings, and then find a pizza place that is open. I brought my \$40.00, so I stopped in for a slice, and a beer. That pizza tasted so amazing, I cannot describe it. The texture, grease, cheese, pepperoni, and crust; each bite was from heaven and the Bud Light in a plastic cup was unimaginable when trying to convey how good it tasted. I could have just sat there all night reveling in this experience. It was raining harder and harder, so I decided I better get back to my shelter, and settle in for the night. As I approached the site, I became aware of exactly how close I had set up my tent to the stream, and what was now looking more like a river.

As I pondered my situation, I decided to look for other sites with higher ground in case I needed to make a quick move. I found some less suitable areas to set up if I deemed it necessary, and decided to gauge this decision on whether or not a rock I had seen in the stream became submerged. The rock was about 18 inches out of the water when I first spotted it. I thought that if the stream overtook the rock by nightfall, I had better move to higher ground. For the next hour and a half, I watched as the rock slowly sunk below the waterline. At nightfall, the rock still could be seen at about 6 to 8 inches above the waterline so I decided to stay. At first this sounds like a risky decision, but what I had come to find out about the other campers was that they were not campers at all, in fact they were what were called squatters, or tent workers, who could not afford lodging so they made temporary housing in tents. They stayed at night in tents, and worked in town during the day. I noticed several of them parking in a lot just west of the campgrounds, carrying groceries, and propane down to their tents. They had been here

for a while and their tents were no further from the stream than mine. I felt somewhat safe that the water would not carry me away tonight. With that said it stormed all night long and did not let up until mid-morning.

Being connected to data had its clear advantages. One app that I had downloaded and had hoped to use was iForecast, an app that used GPS to pinpoint my location, and through my data connection would give me up-to-the minute weather information, but it became useless without a data connection. With the exception of the few times I was in a populated area, I had no connection. Tonight the app called for thunderstorms, turning to snow during the evening. I woke to ice on the tent, and the ground. I looked up to where I had come down the night before and I could see that the mountain had been blanketed with a new layer of fresh snow. I knew I would need warmer clothing. I hoped to acquire such during my last re-supply. As the morning progressed, the clouds separated and the sun emerged. I had to lay everything out in the sun to dry. With the connectivity, I had access to more instantaneous text messaging than I received through the GPS system, and I communicated back and forth with my wife. She let me know that she had procured a condo in Copper Mountain and was emailing the management company, to see if I could check in early. About 12:30 p.m., I received a text that, yes I could check-in early, so I packed up, and began the trek through the resort. At about 1:00 p.m., I arrived at the condo and talked with the reservation person about my trip. He also backpacked, and gave me information about the approaching segments. He said that for him the upcoming segments were his favorite, and for the most part, I would be leaving the up and down climbs for a more level hiking experience. That sounded great to me, even though I had

become accustomed to the climbs and descents. I really would like to hike on more level ground.

Comprehension Discussion: The Researcher's Analysis of Act II

Act II Analysis Introduction

Transitioning from Act I to Act II meant that I had learned the basic outdoor skills that were needed to hike from one coordinate to the next. I started to become competent with basic backpacking skills, such as building a camp, hiking, hydration, and an understanding of navigation as it related to my virtual map. In addition, I gained confidence in my navigational skills using an augmented visual representation of my travel. I was able to orient myself more effectively as time went on, “it may be beneficial for the visual representation of the environment to be shown from a current location and/or orientation of the user so that the user may more easily orient himself or herself within the visual representation” (“Patent Application,” 2015). I now comprehended the connection between the real world and the virtual world.

I began to pick up little intricacies like the importance of cleanliness, and how to feed myself so that I gained the most effectiveness with my nutrition. Probably one of the greatest transitions was the constant need to reduce weight in my pack and make the experience as efficient as possible. Most of the experiential learning experiences from the first Act had become second nature; I was in more of a groove beginning the second Act. Anderson's, 1982, explains that new confidence in my ability takes place in the second of three learning stages, (the associative stage) where, “students move from the slow and deliberate following of instructions towards a more memory and experience-based performance” (Jarvis, & Dickie, 2010, p. 174).

Connectivity

During Act II, the fear of connectivity greatly dissipated and the static forms of mobile learning took on greater importance. Whereas the static or PDF applications were counted on to be reliable, the fluid or connected outdoor mobile learning applications that could not be utilized in the exact environment for which they were created became worthless to me. Reliability in what I was using for survival played a major role in my ability to consistently scaffold my knowledge towards Mastery, “reliable information is information that readers can trust. (Li, Pham, Chuang, & Wang, 2015, p. 72).

Furthermore, Mayer, Davis, and Schoorman (1995) defines trust as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party” (p. 712). For the most part, I found that I had the greatest opportunity for cellular and data connectivity when approaching a main thoroughfare, or when approaching an urban area such as Breckenridge or Copper Mountain. GPS service seemed to be much more reliable with both the phone and GPS texting system. If I could recommend a technology for the future, it would be to integrate cellular and satellite connectivity, to cellular and data connections on the phones of tomorrow. One area where connectivity did make information more obtainable and less subjective was when real-time data or information was needed, for example, weather data, or texting. The satellite system does provide this information, but several times, I received information after long delays. After exploring past studies of integrated systems for communication and data support anywhere at any time (Prasad, 2006). The Future Re-Visited explained an integrated system that took advantage of all connective systems

and would allow for such connectivity in rural environments. “The future of telecommunications is to reach mass population in all regions of the world with services that will benefit humankind leading to the betterment of its and all life in our planet” (Prasad, 2006).

Psychology of Loneliness in the Outdoors

The idea of completing the first week of the study was uplifting, but there were still some feelings of loneliness and sadness associated with being out there by myself. Music and my iTunes application really came in handy as an emotional tool. I reached new levels of happiness, and sometimes sadness, as I listened to the playlist that I had assembled for my hike. “music can induce emotion via a central route including appraisal: memory associations, or empathy, and via a peripheral route, for example via proprioceptive feedback” (Scherer, 2004, p. 239). When I was first preparing for this trip, I had conceived the notion that I would listen to my playlist eight to ten hours per day, but because of the need to have a heightened sense of awareness, coupled with physical fatigue, I did not think to turn on music while hiking.

Adaptive Learning

During Act II, I became more aware of the use of applications for purposes other than what they were originally intended. I would set alarms with the clock on my iPhone to remind me of when to eat, drink, or rest. I would also use a timer to make sure I was not over extending myself, and to make sure I was sticking to my limits or lessons learned that I kept in iNotes. An example of this was when I was leaving Breckenridge; I had gone beyond my set limit of how late I would hike before or during dusk. As I looked for a suitable campsite, I had set my timer to prevent me from hiking too long, and

having to set up camp in the dark. Once I had found a suitable site, I decided to put down my gear, but set the timer for ten more minutes and hike up a little more just in case a better site was just up the hill. That was when I found the most amazing campsite of the entire trip. Without the timer, and my adaptation of its use, I would have probably stopped at the first site and really kicked myself the next day. I manipulated the iPhone and its apps to assist or facilitate assistance through audible notifications and written rules recorded in iNotes. This assists the iPhone as facilitator in order to recognize and attain learning or problem solving tasks and experiences. These reminders helped me stay in Vygotsky's zone of proximal development more consistently. It allowed me to venture further or have confidence in my choices in the outdoor environment, "The idea is that after completing the task jointly, the learner will likely be able to complete the same task individually next time, and through that process, the learner's ZPD for that particular task will have been raised" (Shabani, Khatib, & Ebadi, 2010, p. 238). In this case "jointly" would again refer to the iPhone as facilitator or instructor.

Applications

As I proceeded through Act II, I began to gain a greater perspective on what I labeled virtual representation of three-dimensional virtual environments (VEs; Burigat, & Chittaro, 2007). On my CT app, which is basically a trail map, and can be switched to an elevation map, I began to understand what I would see later with the day in regards to how steep a hill might be, or how exposed I would be once I reached tree line. This understanding of virtual representation allowed me to better plan breaks for hydration, nutrition, and rest. It also allowed me to prepare myself mentally and physically for any major obstacles, e.g., rapid elevation gains or descents, "accurate spatial knowledge of

VEs typically develops very slowly after long periods of navigation or study” (Burigat & Chittaro, 2007, p. 946).

As I completed this segment of my study, I began to have a greater understanding of time and distance, and how my progress fit in relation to the blip on the map, as well as what I was hoping to accomplish in the study. I found that what I had perceived as rules, for example, beginnings or endings of segments, was just a way to structure some organization into how the Colorado Trail was depicted in books, and online media. I did not need to complete the prescribed segments, or start at a particular point the next day. I could go beyond the segments endpoint or stop well before it, if I found suitable areas to set up camp. Moving into the third Act much of the scaffolding support from the apps on the iPhone was removed as I had begun to master many of the experiential lessons throughout the hike. Vygotsky stated scaffolding “can come in a variety of forms, from increasing engagement, providing alternate learning strategies, resolving learning bottlenecks, and (paradoxically) taking away support to allow students to master material, among other things” (Lee, 2014, p. 2).

CHAPTER IV

ACT III--MASTERY

The narrative voice from the participant's perspective.

Mastery

I checked into the room at the condo, and was for the first time lost as to what to do. I opened cabinets and just stared at the dishes, and then I went into the bathroom, where I was amazed at the shower and bathtub. There was a TV. It felt like I had forgotten what this contraption was, and really had no inclination to turn it on. I began unpacking my equipment, because this was familiar to me. I spread it out on the balcony, so it could continue to dry out. Then I sat in a chair on the balcony and closed my eyes. The feeling of sitting in a chair was so foreign, I analyzed the height, the idea of a backrest, and how comfortable my feet were not to have to carry any weight while sitting there. It was a unique experience. I realized I had completed the second phase, or act of this play that I called my journey. After relaxing for about 30 minutes, I took the first of two showers. I would later also take a bath before my wife and kids arrived. I then hand washed a dirty shirt and blew it dry with the hair dryer. After that, I headed back to the pizza place for another slice and a beer. Life had never been so good.

At about 6:00 p.m., my wife and kids arrived. They were delayed because of my son's cross-country meet, and I could tell he was wiped out. They were so interested to hear about my trip. It had been two weeks since I had seen the kids. I told them about

Theo, John, and the other cast of characters along the way. I did not really talk about my emotions, because they would be leaving tomorrow and I did not want those feelings to affect them. I talked about the struggles and the effort it took to climb up the mountains. They commented on how skinny I was getting. I weighed myself and I had lost about 15 pounds. We went out shopping for weather appropriate clothing, but by the time we got out the door, all of the shops had closed. We decided to circle back the next day. Soon we were headed to dinner, and stopped at an Irish Pub where it seemed the whole town had gathered for drinks and revelry. I had a sausage sandwich, and they enjoyed their dinners, then we went to our condo and I slept like I had died. The next morning we had breakfast, and I found what I needed to complete the trip; a pair of North Face pants and long underwear. We came back to the condo, and for the first time the TV was turned on. We watched one episode of *Restaurant Impossible*, and the whole time I was in a daze. Not that I was sick or anything, I was just running on sensory overload. After being out in the wilderness by myself for an extended amount of time, all of the realities of normal life, television restaurants, and now being surrounded by people doing what people do in an urban environment took on a different perspective. My perspective of the world around me was more comprehensive. I noticed many more of the details of my regular life in finer detail. I was aware of almost everything that occurred in a normal environment. Many of the things that I took notice of were passive before I had begun this journey. For example, I noticed the shuttles that transported tourist to and from the condos and surrounding amenities. I found myself thinking how many people rode these shuttles, how fast are they going, how often do they make their rounds? These were observations that I had really never thought about before, but now they seemed to have some

importance. I am not sure if it was because I had been away for so long or if the researcher in me had evolved.

I took one more shower, and then they took me back to the trail. I was so happy and comfortable to be back on the trail, partially because I was well rested, but also because I knew everything was OK at home. I watched them drive off from behind the trees, and for the first time did not feel sad, I could see the end in sight.

While in Copper, I had to come to some realizations and faced facts. I knew I was not going all the way, that realization occurred a long time ago. I hoped to make Tennessee Pass but that was really only a day or so away, so I focused on a target of Mt. Massive, or at least a road that crossed somewhere in the vicinity that would take me to the 160 mile mark, about one third of the entire distance. When I began, I really thought that the 484 miles could be achieved in four weeks, and it could if I were a world-class athlete, about 20 years younger with several years of hiking experience, and the most expensive equipment money could buy. That was unrealistic. Early into the trip, I thought I could maybe cover two thirds of the distance over the three weeks that I had been approved for to miss work. Perhaps I could have covered the entire journey taking no days off and averaging 15 to 20 miles per day. This would have meant pure hiking, no reflecting, no time for anything other than movement through the woods. In the end, I decided that one of the most important things I could do was to slow down, and take in as much as possible. The goal of 160 miles was reasonable, and with the changing weather, it was responsible.

Back on the trail, I headed up the incline I had noted earlier, but suddenly I took a sharp right and basically traversed the south side of the town. After two hours of hiking, I

was a stone's throw from the town center. I was so mad! I could have hiked this the day before, and been miles further along. It seemed to take about three hours to cross the resort and finally make it to the ski area boundary. I obviously needed to learn more about reading virtual maps. During this whole time the resort was sponsoring some type of Ironman race, so more often than not, I was dodging and yielding to trail runners. This was a real pain and continued for about one mile after the boundary where the trail split. About an hour and a half after leaving the runners, I came across a nice stream in a small alpine valley that would lead to the next ascent. There were good campsites, and the day was winding down, so I stopped to make camp.

About an hour after setting up camp, a backpacker approached with his dog. The backpackers name was Paul, and his dog was named Riley. Paul was probably 50 years old and maybe had 5% body fat. He was Australian and very friendly. He asked if he could make camp right above my site, and I told him that was fine. I really appreciated the company. We talked about a lot of the areas we had come through. He said he spent a few days in Breckenridge letting Riley rest so he could heal his paw. We had run across many of the same people, and we had a laugh at the same idiosyncrasies we had both observed about these characters. Paul was through hiking to Durango, and he was both built and equipped to do it. He had his pack weight down to 35 lbs. including Riley's food, and he used trail running shoes, which helped him to cover 20 miles per day on the average. He told me that he would get winterized in Leadville, in order to deal with the pending snow and to let Riley rest a bit. I told him that I really scaled back weight for this last week, and had only brought one bag of beef jerky and seven protein bars. He thought that was a bit light, but we both agreed that we were never hungry on the trail and it was

hard to eat. We chatted a bit longer. He told me that one of the trail runners had come around the corner, ran into him, and fell straight back on his back. He said to Paul, "Sorry man I just ran 58 miles, and I'm exhausted." We both laughed. After that, he went to make camp, and I settled in for the night.

At daylight, I broke camp and it seemed as though Paul was already gone. Today would be the hardest segment of the entire trip. The total amount of time to reach the summit of this ridge seemed to be probably 5.5 to 6 hours. As I approached tree line, I saw a large group of people ahead, I also spotted a really nice cabin off in the alpine meadow to my right. It turned out to be that this is a free cabin where a hiker can make a reservation and stay for the evening. I had no reservation, but I sure wish I did. It looked like a real nice place, and had solar panels, so it probably had electricity. As I approached the group of about eight people, the first hiker I came to said "Please excuse us. We are holding up these other guys with our conversation." It turns out that 2 of the gentlemen were trail volunteers who were well into their 60s, and the other 6 were just hiking back to Copper Mountain and had stopped to talk. I was in a bit of a hurry; the clouds had been rolling in and out. I knew that the weather can go from sunny to stormy in a matter of about 15 minutes when above tree line. I thought, I am also exposed to lightning and it seems that each week there is another death caused by lightning strikes in these circumstances. I said my hellos, again thanked the volunteers for their work, and began my summit of the ridge. The clouds rolled past at an ever-increasing rate of speed, and I decided that if I did hear thunder I would have to turn around and descend back to tree line. With no sound or sight of lightning, I decide to press forward. The hike was about two miles across the ridge then back down into what seemed to be a new range of

mountains. The crossing seemed to span out forever and as I descended, the rain and wind began to pummel me. I was dressed in a moisture wicking t-shirt, and down vest, but I was soon over matched with the sleet and wind that was impaling my clothing. Even my newly acquired pants took on water, but held up during the storm. About half way through, I knew I needed to stop and put on extra layers. The sleet was marble sized and stung my skin with each passing second. When you are up on a ridge like this, there is no place to hide, no trees, and very little coverage from the rocks. I saw a huge cairn, a pile of rocks used to mark the trail, that someone had constructed, these were used to let hikers know they were still on the trail, so I scurried down to where it was and tried to hide behind it as I removed my pack, and searched for the clothing that I needed to continue. After putting on the layers and my waterproof jacket, I continued, but maybe 30 minutes after putting on almost everything I had; the sun broke back out, and I was burning up from the heat. I decided to keep the clothing on just in case the weather broke again, but of course, it did not. The summit of this mountain was miserable, and once I reached tree line again, I had to take off some of the layers because I was soaked with sweat.

I stopped, gathered myself, ate a protein bar, and rejoined the trail again. The climb down to the Camp Hail area was still about four miles, and I needed to keep moving to make the 14 miles I needed to complete this section. About two thirds of the way down I passed a great campsite, but I was too far from water to stop, so I decided to continue on. This had been the longest I had traveled without seeing another person, and it became a bit eerie as I continued. About another hour into the hike, I heard the familiar sound of mountain bikes behind me. I turned around, surprised to see two girls maybe 22 years of age barreling down the trail. They passed and said “hello” in a very friendly

voice, and as they passed, I noticed they were twins, but one had a small birthmark near her eye. I guessed I noticed this detail because I had been alone for so long on this day. It was weird that they had come down from the area that was so inhospitable to me earlier. They just seemed so out of place in this isolation. In the next 30 minutes, I rounded my last corner before coming to Camp Hale. At the bottom, there was a stream where I filled up my bottles and hydro pack. While I was doing that, a hunter appeared and asked me if I knew how to get to the molybdenum mines. I told him that it was much easier from the Copper side of the climb and explained some of my trials to this point. He pulled out his iPhone with a Google earth picture of where he was trying to get to and I showed him what he wanted to do using the CT app. He needed to drive to Copper, and hike up from there; otherwise, he was going to add hours and a much more effort if he was going to reach his destination from this side. He thanked me and went back to his car to drive to Copper Mountain. This encounter was the first time I had noticed anyone using technology for navigation, or anything related to being in the outdoors. He had no idea how to use, it and was in the wrong place. I was pleased that I could share, my new found knowledge, and felt that maybe I was learning about using mobile learning in an outdoor environment.

For me the Camp Hale area was sort of the armpit of this entire trip. I had hoped to find a campsite near the stream as the trail continued for a couple of miles down a dirt road, which was open and flat. Another surprise was the appearance of snakes. As I was walking, a snake maybe 18 inches scooted out from my path. This absolutely shocked me, and I wondered what in the world a snake was doing at this elevation in these cold conditions. Later I saw another dead one that had been apparently run over by a car, and

as I walked along the road there appeared to be several holes where these snakes lived. I was not going to camp down here, I do not like snakes. Long story short, my 14-mile hike now turned into a much longer hike because I decided to continue on to a point where I knew there were no snakes. I imagined them getting into the tent, and my sleeping bag, or nesting underneath me at night. I knew the isolation and appearance of two snakes was getting the best of me, but it gave me the motivation I needed to continue on.

About 12 hours into the hike, and ascending a new mountain, I noticed some downed trees that were purposely placed into a makeshift path. Upon closer examination, I made out a small campsite that looked great compared to my earlier alternatives. I set up camp and noticed that there were a few large pines that had died but not fallen down. I arranged the positioning of my tent, so that if one did come down during the night, it would fall against the living ones around my tent and cut down my chances of being crushed.

The next morning I was happy to be about five miles into the next segment, and I felt as though this could be a more relaxing hike. I took pictures of all of the foliage for later identification, as a food or medicinal source. I also reflected a lot on what I had presumed this trip would be like, and what it had actually become. I had hoped to practice more survival skills such as fire building, and shelter. I wanted to try to procure food, at least plants as a food source, but it had been so wet. The isolation and loss of reliable connectivity did not lend itself to the risks of becoming sick from eating wild plants. I faced numerous risks that I did not anticipate; such as dehydration, hypothermia, and physical problems. I was disappointed, but at the same time given my level of experience

and health at the time of taking on this venture, I felt it reasonable to continue with what I knew, and to let the naturally occurring risks be the ones to overcome.

I climbed maybe an hour and a half before approaching another road, I crossed, and suddenly I was in another large alpine meadow. I could tell there were hunters out. From what I could gather, it was bow-hunting season so I tried to make as much human noise as possible, so as not to get accidentally shot. The climb through the meadow was long, but pleasant. It lasted about 90 minutes before turning into the mountain to gain some elevation again. After climbing for a while, I came to a forest service road that the trail would follow for several miles. It was a bit boring, and again I noticed that I had not seen another human since the day before. One nice thing about following the road for what seemed an entire day was that I did not need to constantly monitor my feet, and I could look around a bit. The trail ended at Highway 9 and the Ski Cooper ski area, not to be confused with Copper Mountain. There was a rest stop with bathrooms and I saw a couple of cars pull in to use the restrooms. I sat down on a bench just outside of the rest area, put in my headphones, and had a protein bar while I listened to some more music. Led Zeppelin's Ramble-on came on and it was the most fitting song for the setting. I finally felt like I was beginning to enjoy myself a little bit.

After resting for 15 or 20 minutes, I decided to press on. I crossed the parking area then rejoined the trail. About 100 yards from the trailhead, I saw a box that said "a surprise for hikers of the CT (Colorado Trail) and CDT (Continental Divide Trail) from your friends at the Leadville Hostel." I did not really know what to do, and was a bit worried to open the footlocker sized box, but in the end I opened it and to my

astonishment it was filled with canned pop, bags of chips, and Little Debbie's. I grabbed one of each, and swore to make a donation to the Hostel when I got to Leadville.

With each new segment or mountain range the landscape and environment changes. Here the trees grew in funny shapes, sometimes having two trunks that reconnect from one, but not in a V-shape as many trees do, but more of a U-shape almost like someone forced it to. Also, the branches came out much higher on these trees, leaving them bare for their first 20 to 30 feet up the trunk. This allows me to see the forest through the trees. This area is very well known for its cross-country skiing, and the hut system sometimes referred to as the "10th Mountain Division Huts." The hiking is very steady and enjoyable in most areas. I am just walking on pine needles and very smooth dirt. As I continue, I start looking for campsites but there just is not an ideal place to make camp, and I am not sure where the next water source will be, so I decide to keep going. Finally, I descend down into an area with a pretty large stream, but still no camping spots. After crossing two forks of the stream, the ground lies out flat and small, well-manicured campsites show themselves. I stop, make camp, and look to the future days ahead.

As I am resting in camp, I again realize that I have not seen anyone else on the trail for at least 24 hours. I did see the people in their cars at the rest stop. I began to wonder if I was the last person on the trail. I have not been spooked in a while but it has become a bit weird. To keep my mind occupied, I make up extra chores like stream bathing and washing clothes. Cleaning up is nice and refreshing, but it left me with a chill that seemed to last through the night. After the chores, and nightfalls I settle in and sleep, still a bit spooked by this new type of loneliness.

When I wake up, I realize I had slept a bit longer than usual and start to break down camp. It is drizzling again, and it has been 36 hours without any human contact. Just as I am thinking about this a young couple passes by on the trail, and I am again comforted to think I am not the only one out here. They pass by and the guy says “what about this rain?” The girl says nothing, but smiles and I say hello to the both of them. They seem to be in a hurry but did not make much of an effort at any type of greeting. Ten minutes later, I meet Adam. I am breaking down camp, and this young guy maybe 24 to 26 wanders by; he looks a lot like Theo, but more put together with real equipment. He strolls up and we introduce ourselves. Adam is through hiking, but like myself, this is the first time he has backpacked for any distance. Well, I should not say like myself, at least he has hiked for some distance, and spent the night alone in the forest. We talked for a while as I packed up, and suddenly he decides to brush his teeth, which I think is really weird. He said he had run into Paul, a day or so back, and Paul was able to give him a lot of great advice. Like myself, Adam's pack was way too heavy and he was trying to get to Durango. Paul gave him some hints on things to change around which would make his trip easier. I guess Paul detoured into Leadville, like he had planned and he was now somewhere behind me. Just when I thought Adam would be joining me for the day, he was off to continue to Durango. I finished packing and was maybe 10 minutes behind him. I took it a bit slow, mainly because where I enjoyed the conversation, Adam really loved to talk.

Today would be my last day of long hiking I knew I would cross through and over Holy Cross Wilderness Area, and with any luck come out near the Mt. Massive Wilderness Area, which would be my extraction point. I decided since I was going back

to work on Monday, I would take three days off to recuperate and get back into the swing of things. This would put me near my 160-mile goal, and I would have accomplished the learning outcomes.

The day began rainy, and I had noticed that the two hikers who had come through camp earlier had rain fly's covering their packs. I had purchased a tarp that I was to use as a footprint under my tent, as well as a makeshift rain fly. Maybe it was rushing to get on the trail, or being distracted by Adam, but I decided not to cover my pack for whatever reason. Maybe I was being optimistic about when the rain would stop. As I eased out of the area, I began to climb again. Conferring with the CT app, today's climb would again approach tree line, but not really go past. The climb was long and steady, sometimes steeper than I would have liked, given the amount of rain that was falling. Usually, the forest provides some cover from all of the falling water, but today the rain was so hard that the trees would not help, and at times, the drops from a particular tree seemed to be bigger than those coming from the sky. When I rested, I looked for a large grouping of trees and huddled on the downwind side to have relief from the cold thrashing. As the climb became steeper, a familiar voice called to me, "Ivan." It was the first time that I had heard my name used on the trail. It was Paul, and his dog Riley. He was making his way up to where I was. Paul was funny with his Australian accent dropping all kinds of expletives about the conditions we were hiking in. He especially liked to drop the F-bomb, and it made me laugh because I felt the way he talked; but was too wet and cold to really relay back my sentiments in the same way. After a moment or so, I let Paul and Riley pass and began hiking, watching them disappear at their rapid pace. After summitting the first ridge, I ran across a group of about 10 hikers. An older lady was

leading the group; she was probably close to 70 years old. There were adults of all ages in the group; two younger girls must have been in their late teens or early 20s. They were not through hikers but they looked as though they had equipment to spend a night or two. They also did not look like they were outfitted for this type of hiking, and one or two of the participants had the very cheap rain ponchos on. The older lady taking up the rear looked at me with a smile and said, "Lord bless this rain." I was thinking somewhat the opposite.

The second part of this terrain was very rocky and root covered. The wet roots were a bigger concern because unlike a wet rock where I might slip backwards or forwards, roots can cause you to slip backwards, forwards, and side-to-side, especially at weird angles depending on which way they are growing. I can look at the root, and carefully place my foot on the root, but then all of a sudden I can go any direction the root decides to take me, and I do not have a plan for that. I thought it is like stumbling in three dimensions. This thought would somehow consume me for the next two days, and I later figure out why.

The day stretched on forever. This hike was only supposed to be about 10 miles, but with each step, I would slip a little or sink three to six inches into the mud. At one point, I was so cold that I stopped, and decided to put on every piece of clothing I had with me. For the first time, I wore my winter gloves and a wool beanie to cover my ears. I put on my down jacket over my down vest then my rain jacket over that. My hands had swollen, so for a while I could not get the gloves all the way on, and had to grip my trekking poles with one good finger that had made it maybe three quarters of the way up the finger canal of the glove. Everything was wet or damp, but I felt somewhat warm.

After crossing the second ridge, I was again entirely alone, and the trail began to level out as the day headed towards a close. My pack felt like it had doubled in weight because of how much water it absorbed, and for the first time since my first week on the trail it was beginning to dig into my waist, rubbing and clawing. I knew I would pay for having been so stubborn, and not putting the tarp over the top. As I wound my way through the final mile or so, I decided that this would be the end. I have reached mile 157. Tomorrow, I might hike up to mile 160, and return, but I would be camping at the rendezvous point where I had told my wife I would meet her.

As I neared the trailhead, I saw a sign that said no camping within so many feet of the Timberline Lake Trailhead. I did not want to see this sign; it should just go away. The trailhead was about 100 yards in front of me, and to my right hidden behind the trees were a couple of really nice spots to camp. I rationalized that the area around the trailhead really did not start until I crossed the parking area, and that these spots over here to the right were there for a reason. So I made camp and began to set everything out to dry.

Down in the parking lot, I noticed that there were six or more utility trucks, and halfway up the next mountain there were some major power lines crossing the range. Soon after making this observation, an older Hispanic gentleman came down from the adjoining trail into the parking lot. He was hissing and cursing under his breath. I could not make out why he was so mad, but I decided to say "hi." His name was Benny, and he led a crew of utility workers that were up clearing the trees around the power lines. Benny looked much older than he was from what I could tell. He had done time in prison, and had a teardrop tattoo under the eye. He was the nicest guy, and was just mad that he

was so wet; I played along cursing the rain and the moisture. He liked to talk, and told me a few stories about how he had installed these power lines 15 years ago, how much electricity they carried, and to where. He also told me about a woman utility worker that they had to carry out because of hypothermia, as well as other job related things. After about 30 minutes, Benny's crew began to emerge from the forest. It was about 4:00 p.m. They lingered for about 45 minutes probably because they were supposed to work until 5:00 p.m. I retreated to my camp, continued to shake things off, and lay them out to dry.

As I sat in camp waiting to become tired, I began to reflect on the trip. I had felt that I failed miserably during the first week, but I covered more miles that first week with a pack that was 20 pounds heavier than it was now. The terrain was also much tougher as far as the total elevation gained, and I had not exercised, or physically prepared for this trip. I had decided that it would be best to learn everything on the fly, except for those few the bare essentials like how to use my stove; which I did not even use for the last two-thirds of the trip. I knew that I would not have made it this far without the iPhone and its applications. Maybe I got lucky, but I felt just the opposite. I felt that I had left too late in the season, and that the weather was really never on my side. I also began to think about my proposal and what or how did the journey fit with what I had proposed. Right away, I knew that it was the applications on the iPhone, and the way I adapted their use, that helped me build procedures. They kept me on track throughout the journey. I also kept thinking about the wet roots and the idea of slipping in three dimensions. That meant something in the grand theme of the trip, but I was still trying to figure out what. I put in my headphones for only the third time on the trip, and began to listening to all of the

songs I handpicked for the journey. I also began to dance like a hippy, not only to keep warm, but because the music and the rhythm fit so well.

I awoke the next morning, and went about my usual morning rituals. I powered up the battery system, but the rain had some effect on it, so I decided to power it off. I had enough power for the iPhone and GPS system to communicate with my wife. I began laying out all of the equipment and supplies that had been soaked from the previous day. The sun was out and everything began to dry quite quickly. At about 10:00 a.m., I received a text that my wife would be leaving soon. She was about two and a half hours away, so I figured this would give me enough time to let everything dry, and maybe hike up the next section for 30 or so minutes. At around 10:30 a.m., I heard a car pull into the parking area, and this was not a big deal given the number of vehicles that were in and out the day before, but as I was packing someone headed up the trail towards me, it was Jamie, my wife. The iPhone texting app will send, or fail to send messages when prompted, but my Earthmate app, coupled with the GPS system holds messages from the sender or receiver and sends them when a signal is detected from the satellite to which it is synced. My wife had sent the earlier message around 7:30 a.m., not 10:00 a.m. I was so happy to see her! She helped me pack everything up, and load the car. I then took one last very short hike up the next section to see what it looked like, and to say goodbye. We jumped in the car and headed to Leadville for an overnight trip, and to begin my assimilation back into society.

Civilization was now very different. Everything was bigger and brighter. This first day seemed like a dream, where I was watching myself from above. I remember walking down the street for lunch, and taking in every movement and every sound. The

environment had no smell, and my sense of touch was different, like touching things for the first time. We stopped at a Mexican restaurant, and I gobbled up every last drop of salsa, finished my plate, as well as my wife's. I was not hungry on the trail, but now I was famished. I had lost 24 pounds over the three-week period. We stopped in all of the shops. At the outdoor equipment shops, I looked at all of the devices and equipment that could have aided me during the trip. The first store carried the same pack that I used, and had all of the sizes displayed. I looked at them and wished I had picked a pack that was smaller; which would have forced me to pack less, and more efficiently.

I also pondered all of the other mistakes I made, and concluded that I never really enjoyed the trip. Yes, I had moments where I felt great, maybe even exuberance at one point or another, but I would never do this again by myself. I also thought that I would never suggest that someone replicate how I had gone about doing this study. It was ludicrous to go out as unprepared as I was both from a physical and mental approach. Reading some of the material from a beginner's backpacking app, I should have been preparing and learning what I was doing six to nine months ahead of time, and that's for a group hike of maybe a week or so.

We stayed in Leadville for a night, and whooped it up a bit. For some reason I was enamored with the jukebox and probably spent \$50 playing songs, most of them from the playlist I had with me. The next day my wife asked me to drive home, and she may have regretted that a little bit because I could not focus on my driving, I kept looking up at all of the mountains I had crossed, and tried to pick out places where I might have been. I really did not realize the scope or magnitude of the trip until I saw how far I had come, or the heights of these mountains. As I saw Denver for the first time in three

weeks, I could not comprehend the size or sprawl of the city. It was so flat; I did not remember it this way. Over the next few days, I really internalized everything around me, and reprioritized what was important.

Mastery Discussion: The Researcher's Analysis of Act III

Act III Analysis Introduction

On the first day of Act III, I was presented with an opportunity to educate a hunter who had just arrived in the area known as Camp Hale. This hunter had been climbing around trying to figure out how to get to an area that I had come down from earlier in the day. This event presented an opportunity for me to step out of the student role and become the facilitator to assist the hunter with his learning through his smartphone. He showed me where he wanted to go from an image that was downloaded from Google Earth. I was able to look at his image and by pulling up the CT app, I was able to interpret where he needed to go and instruct him on how to interpret the virtual representation of the area on the smartphone. I then explained that he really needed to get back in his car, and approach his destination from the Copper Mountain side of the trail. This experience and my ability to instruct this individual with the tools I had incorporated into my outdoor learning provided me the confidence to master knowledge that I had learned during the earlier two Acts of this study. My mastery of the smartphone and ability to interpret information created a solid foundation of knowledge from which the scaffolding or assistance I had received earlier from the iPhone could be removed. Wood, Bruner, and Ross (1976) defined scaffolding as assistance from an expert to a child or in this case, a novice to achieve what is beyond their ability in order to achieve independently. Vygotsky's zone of proximal development (ZDP) coincides with

scaffolding in that his model of instruction emphasizes the instructor's role as a more knowledgeable than that of the learner in order to assist the learner to "solve problem-oriented" tasks in their ZDP. Furthermore, the scaffolding is removed, as the learner becomes more capable (Kim, & Hannafin, 2011, pp. 406-407).

Pinnacle

As I practiced many of the lessons that I had learned, I became more competent with my education in this outdoor environment. As my competence grew, I was able to reflect more on the trials and errors, as well as the success I had enjoyed. I had achieved complete confidence in my abilities and reached a pinnacle in my outdoor education using mobile learning. These reflections also led me to think about what others should consider when applying mobile education in an outdoor environment. "Reflective practices can facilitate a learning dialogue between our implicit embodied experience and conceptual aspects of our consciousness" (*Jordi, 2011, p. 181*). The following is a list of considerations for mobile learning in an outdoor environment:

Preparation is key:

1. Know your environment, and how that environment will affect you physically and mentally.
2. Know your equipment and the true capabilities of what you expect your equipment to provide.
3. Be physically prepared by having the endurance for the situation.
4. Practice as much as possible, and have contingencies for those situations where outcomes may be critical.

Know your limitations:

1. If you rely on connectivity for information make sure that your service will be 100% reliable when needed.
2. Establish expectations and benchmarks only after you have a reasonable understanding of what is entailed to be successful.
3. Understand that the ultimate failure is putting yourself into critical situations.

Experiential Learning to Scaffolded Knowledge

Transfer of learning can take on many forms and these forms can transition to and from varied learning theory.

1. Trial and error: Experiential learning was predominate early in a new environment, for example, finding and testing physical limitations. With a wide base of experiential learning in Act I, the base narrowed over the next two Acts to form the pinnacle at the mastery level (see Nikolaeff Model of Mobile Learning in an Outdoor Environment, Photo 16).
2. When diagramming Vygotsky's scaffolding I used a pyramid structure for continued mobile learning, with new experiences through Kolb's Experiential Learning making up each layer of scaffolding from Act I Inability, Act II Comprehension, and completing the model through Act III Mastery. The iPhone and apps replace Vygotsky's human assistance of a teacher or more knowledgeable peer as the mentor and guide. An example for how experiential learning that progressed through scaffolding was my ability to use navigation to locate resources and track my progress. In the beginning, I felt apprehension and low confidence with my ability to progress at a satisfactory pace. I did not find resources such as water when it appeared to be on the virtual map. These

different experiences added to my fear and heightened my emotional state in a negative way. As I progressed and gained understanding of how the apps worked and what I could expect as I moved forward, the fear and emotional toll began to dissipate to the point where I was extremely confident in my abilities by the end.

3. Each experiential learning experience took place in varied spectrums of time during the study. Any time in which there was an activity where I had little to no background or experience, I participated in an experiential learning event, which was longer, if I had not had a similar experience in the past. As I entered into more familiar experiences, the time from facilitation from the iPhone and apps shortened and my confidence grew allowing the previous scaffolding to be reduced. Depending on the circumstance, a concrete experience could occur over a longer period of time, or in real-time, almost instantaneously. In these circumstances, the learning behavior could almost be instinctual, but still follow Kolb's Experiential Learning Cycle. e.g., trying a variety of adjustments for my pack at the point where I could no longer bear the strain on my shoulders (real-time). Using the U.S. survival app to explore my emotions and how music increased and sometime decreased my mood.

Using Vygotsky's theory to explain how prior experiences are pulled from memory will allow for expanded dialog of how information is augmented using m-learning as well as adapted for purposes beyond memory's intentions. Lourenço (2012) in explaining similarities between Paget and Vygotsky in regards to similarities in memory explained Vygotsky's idea "it is due to these successive internalizations/externalizations that the Vygotskian individual acquires, for example, forms of action increasingly more advanced and mediated . . . that development is not merely an accumulation of changes,

but rather a complex dialectical process, characterized by periodicity, qualitative transformation of one form into another, intertwining of external and internal factors, and adaptive process,”(Lourenço, 2012, p. 283). The second research question deals with the translation of information. Rationality for decision making and learning is more based upon prior knowledge and experience, “Vygotsky’s theory has gradually received the status of a complex background which can be fruitfully used to stimulate student development and to help them master the means for transferring competencies, knowledge and skills from current to future activities in a generalized form instrumental to thinking, reasoning and problem solving” (Petrová, 2013, p. 239).

The combination of Vygotsky’s theory and experiential learning was chosen due to the need to explain individual learning experiences using the iPhone as a teacher/facilitator and how the knowledge moved through the three Acts, scaffolding from Inability to Comprehension to Mastery. Vygotsky believed that learning and development were different and that learning leads development, but moreover learning creates development or ZDP (Vygotsky, 1978, p. 90). Again, Vygotsky’s zone of proximal development (ZDP) is the distance between actual development levels and potential development levels that a based on independent problem solving, or for this study experiential learning experience, under the guidance of a teacher or facilitator, in this case the iPhone and apps, or collaboration among more experienced peers (Vygotsky, 1978, p. 86). Much of the experiential learning had to be drawn out of the apps on the iPhone, with very little if any direction provided by the iPhone/teacher prior to a learning event. This form of learning is contrary to most outdoor learning situations where an instructor is present. The learning may be modeled by the instructor indirectly prompting

student engagement, “. . . rather than the teacher showing and telling the students how to move, the teacher uses a series of questions to prompt student engagement in both cognitive and psychomotor domains” (Glyn, 2007, p. 10). Metzler, Tjeerdsma, and Mozen (2000) further explains that teachers may ask questions that prompts the students to think, which then leads to an answer in the form of some type of movement (Metzler et al., 2000).

For this study, the primary instruction came from the smartphone and applications. The experiential aspect of the study had to do with the participant/researcher and the research questions as the guiding principle for the realization of learning outcomes. The important factor to consider is that experiential learning can be crafted in different ways depending on the environment and role of the facilitator. In my case, the iPhone took on the role as a mentor, in the construction of the learning situation, “the learner is encouraged to employ a variety of different strategies, some more appropriate than others, until he or she finally discovers the best coordination pattern” (Rose & Christine, 2006). This coordination took place as I worked to develop strategies to use the iPhone and its applications to help assist me with the mental factors of physical fatigue, for example, setting alarms and timers to alert me when I should hydrate or begin looking for a campsite. Once I had mastered or gained competency with an experiential learning task, I was able to move on to more complicated or higher levels of learning, building, or scaffolding on previous experiences.

Summary of the Findings

Mental Awareness

Early on, the greatest experiential learning situation that occurred was not physical, but emotional, “Kolb’s learning cycle . . . , is a constructivist theory concerning how learners take experiences from the external world into their private worlds of thought and emotions” (Yardley, Teunissen, & Dornan, 2012, p. e103). I did not expect the emotional toll to be so difficult, and struggled to overcome the desire to stop the study within the first 72 hours. I missed my family and the personal interaction with people. Starting this study as an unprepared novice compounded my sadness and need for human interaction, “evidence has been growing that when our need for social relationships is not met, we fall apart mentally and even physically” (Marano, 2012, p. 1). In the beginning, my pack was too heavy; I did not have a good understanding of how to interpret the information from the applications on my phone, and many of the processes and procedures that I had proposed did not work. McEwen (2002) explains new experiential learning as raw experience that transforms or progresses into workable knowledge at which point the participant makes sense of the experience through reflection of the experience. (McEwen, 2002). My GoPro camera that I was using to help record notes for my narration broke down almost immediately. I had misinterpreted how my solar charging system worked and was having to conserve power early on. I had very little cellular connection, which affected most of the applications I was hoping to use as well as the ability to use public sourcing. In the beginning, I had my own thoughts about what I would be able to accomplish, but I had not grasped the reality of being in the outdoors. Ewert, Mitten, & Overholt (2014) describes being in the outdoors as “A variety of

self-initiated activities utilizing an interaction with the natural environment, that contain elements of real or apparent danger, in which the outcome, while uncertain, can be influenced by the participant and circumstance” (p. 175). Furthermore Mullins (2014) further defines outdoor adventure education as, “described as employing experiential education, occurring in diverse settings, and being primarily concerned with participants’ intrapersonal and interpersonal learning” (Mullins, 2014, p. 132). The element(s) of apparent danger, uncertainty, diverse settings, and intrapersonal and interpersonal learning are all inherent characteristics for emotional impact and mental effect as I documented early on during Act I. What allowed me to continue and later thrive was the ability to adapt to the situations that arose, and gain an understanding of how to use the apps that did work in my environment, “introducing a new tool and putting an existing object to new use, for instance, clearly are ones that may enhance the performance of existing strategies and permit variations that increase the yield of activity undertaken in that task environment” (Kirsh, 1996, p. 449). As I learned to adapt and learn from the iPhone and its apps my efficiency increased which allowed be to gain confidence which lead to my trail esteem.

While researching and writing my proposal, I did look at cellular and data capabilities in the areas that I would be hiking. I did understand that there would be times when I would not be connected to the networks. With this insight, I knew that there would be times where static applications would be my only source of information. The one application that helped me overcome the emotional toll, and helped me to regain the confidence I needed to continue, was Survival Guide a static PDF app. The second chapter within this PDF app explains the psychology of surviving alone in an outdoor

situation. Most of what is explained was exactly what I was experiencing. One of the most important lessons was to know the difference between stress and distress. By being able to read about what I was experiencing, and that it is a common occurrence, and to further learn that transitioning my feelings from stress to distress would lead to failure, I was able to calm down and better access my emotions and what lay ahead. During post-study research of the psychological effects of survival in the outdoors and loneliness, I found a study on Internet based cognitive behavior therapy done by Litz, Engel, Bryant, and Papa (2007). Even though the study focused on military people suffering from PTSD, some of the same parallels of how the survival app and their Internet based therapy aligned. In their conclusions, they found that, “Self-management cognitive behavior therapy is a potential solution to the demand for efficient, low-cost, and stigma-reducing interventions for traumatic stress” (Litz et al., 2007, p. 1682).

Navigation

The application that I used the most was the Colorado Trail or CT app. This app was key to navigating approximately 160 miles of my journey. The app kept track of where I was in relation to the trail, and helped me recognize upcoming water sources, campsites, trail markers, resupply points, and elevation. In the article *A model for understanding how virtual reality aids complex conceptual learning*, Salzman, Dede, Loftin, and Chen (1999) describes how virtual reality users are enabled to interact with special representations from frames of reference in order to improve performance in comparison to users not using virtual reality. I found that over time I became more comfortable using the CT app for navigation, which lead to greater confidence in my ability, which lead to greater comprehension in what the app provided as information.

There were times when the trail split with no trail signs, and I would hike for some time only to find that according to the CT app, I was off course and would need to retrace my steps. Early on, I could not figure out how the CT app stayed connected when all of my other applications were disconnected from the cellular network. I later learned through a conversation with a Park Ranger that my phone had GPS, and that that is how the CT app kept track of my location.

With the information gained by using the CT app, I began to build strategies to cover distances, times to eat, and rehydrate, and when to camp based upon time and distance. I also learned to plan ridgeline crossings and climbs up and over summits, to be in the safest possible environment based upon time of day, and changing weather. Moving from basic tasked-based thinking or concrete-experiential learning to more advanced abstract reflection, or Vygotskiĭ and Kozulin (1986), mediation or internalization, of how information generated in my environment allowed for advances in my scaffolding of knowledge. Even though I needed the iPhone and CT app to provide navigation and elevation information I was able to connect environmental information that I had learned from other apps to both my virtual and natural surroundings. For example, one of the basic survival lessons found in backpacking and hiking applications was not to be caught up on a ridgeline with thunderstorms approaching. This information coupled with the elevation map on the CT app allowed me to make better decisions in regards to when and how quickly I should cross over high altitude crossings, like ridgelines.

Adaptability

I found new uses for many of the applications on my smartphone. I would use my clock app to signal when it was time to stop and re-hydrate. I used my camera to collect photos of plants for later identification as food sources. I would take a photo as a frame of reference when I approached an intersection in the trail that was unmarked, so that if I found myself going in the wrong direction, I would be able to make the right correction after I retraced my steps. This alone showed a progression from using and understanding virtual reality to adapting my iPhone and apps to create a virtual representation that I could later use for information if needed. This event or series of experiential learning experiences took me through Kolb's Experiential Learning Cycle, even though a learner can experience any of the stages in any order, in this case I followed the cycle as it is traditionally diagramed:

1. Concrete Experience – Used iPhone apps as intended for survival purposes.
2. Reflective Observation – Many apps are built into the iPhone to complement its use, such as, the camera, timer, and iNotes.
3. Abstract Conceptualization – These apps and functions of the iPhone could be used for outdoor education and survival purposes beyond my original intentions.
4. Active Experimentation – Used iPhone camera to take photo (virtual representation) as a frame of reference in case I was lost.

Other adaptations included my use of music and power conservation. As my journey progressed, I found that my iTunes app helped with increasing and sometimes decreasing my mood, which for the most part increased the pace at which I hiked, and

gave me a boost of energy. *The effects of different types of music on mood, tension, and mental clarity* (McCraty, Barrios-Choplin, Atkinson, & Tomasino, 1998) investigate the role of music in regards to emotions. What was confirmed from prior research was that music does play an important role in reducing stress, fatigue, and negativity, while increasing emotional well-being and mental clarity (McCraty et al., 1998, p. 83). Another adaptation in a different form was my need to conserve power do to my failed power system. I learned that I needed to switch back and forth from airplane mode when I was not using the phone. This allowed me to only use 10% to 20% of the phone's power each day, instead of running short on a full charge after only one-day's use. In conjunction with the airplane mode, I would use my backup phone, which did not have service, but could be used to take photos, record notes, and listen to music. Because it was unconnected, it did not search for a data or Wi-Fi signal, which in turn made it very efficient in regards to power usage.

Connectivity

During my proposal, I conducted pilot studies to test the idea of mobile learning in an outdoor environment. I found that I was connected to the cellular network most of the time. As I stated earlier, I knew that I would be in more remote areas, but felt confident that the lowest connection rate would be probably 30% of the time. During my journey, I had no way of calculating the amount of time I was connected, but felt that it was well below 5%, and that was generous based upon intermittent texts that would transfer over the network. I was only connected to data service when I was in a reasonable proximity of an urban center, e.g., Breckenridge, Copper Mountain, Leadville, and major highways. The Institute of Electrical and Electronics Engineers have written

several papers on the science of cellular signals and the “pathways” of such signals in urban and mountainous areas. In most circumstances, there must be a clear pathway for a signal to travel in order to receive clear cellular voice or data service. Mountains provide several natural obstacles and it is not economically feasible to add the number of antennas needed to support service in every outside environment (Benner, & Sesay, 1996). With most of my applications needing a data connection to work, I was primarily reliant on static PDF applications, which were no more than guides or instructions downloaded to my phone. Based upon my experience, I would claim that the most useful app would have been a weather app for forecast incoming weather, but the four apps that I had on my phone, needed to be connected to a data network to be useful. Previous studies have shown concern with smartphones and apps in regards to data transfer. O’Neill and Brady (2012) pointed out in their study, *Colorectal smartphone apps: opportunities and risk*, that there is little to no regulation of apps, the rating of apps is subjective due to the commercial aspect, and that there are “safety concerns” regarding the reliance of data transfer (O’Neill & Brady, 2012).

As a safety precaution, I asked my wife to purchase a satellite texting device that would allow me to make contact in case of an emergency, and to contact her for re-supply. The satellite system worked well in open spaces, and when there was not dense cloud coverage, but the system has to have a clear path to the southern sky, and text messages are not immediate with observed delays of up to 90 minutes.

Augmentation

My smartphone was not a tool like a knife or a camp stove, but it was highly valuable as a tool that augmented my learning experience. I do not know if I would have

continued my journey if I had not learned how to deal with stress from iSurvive, and I would not have learned how to navigate as quickly, and when and where to draw water for hydration, without the CT app. Did this mean that I would not have learned through trial and error? No, but it assisted in a quicker progression of learning, that allowed me to gain knowledge and experience at a faster pace. It also allowed me to build greater confidence and what I call “trail esteem.” Tossell, Kortum, Shepard, Rahmati, and Zhong (2015) article, *You can lead a horse to water but you cannot make him learn: Smartphone use in higher education*, shows evidence that smartphones and apps used generally in a formal education setting may distract learning, but “when smartphones are used with specific learning objectives in mind, then these m-learning platforms can significantly enhance the learning experience” (p. 723).

Public Sourcing

Linking pedagogy and public sourcing as a function or augmentation to formal learning, one must first understand that this process requires that a Master/Apprentice relationship be established for the information to be credible. In a recent article published by the British Journal of Educational Technology, Pimmer, Linxen, and Grohbiel (2012) explain how this transformation of information is now taking place in developing countries “. . . the main direction of techno-centric and transmissional approaches appears to be from developed to “developing” countries respectively from experts to novices.” Concerning learning theory, this approach also supports Vygotsky’s theory, “Vygotskian method of learner support that involves the learner working with some assistance until they are able to work at that level without assistance” (Lim, Campbell, & Smala, 2012, p. 122). In situations where the learner is truly a novice and may not have time to gain the

information or instruction to immediately respond to a situation in an outdoor environment the experience may become instinctual, but still experiential and after reflection scaffolded. More likely, this approach would fit with Kolb's experiential learning theory. The participant gains immediate knowledge through an experience that allows the him or her to be assisted or augmented by similar past situations or common sense creating a learning outcome which can then be identified after reflection, "learning is considered as situated meaning-making and identity formation" (Pachler, Bachmair, Cook, Kress, & SpringerLink, 2010; Pachler, Cook, & Bachmair, 2010).

Hardware

Up to this point, the focus has been on the software components of m-learning in an outdoor education setting. Because of logistics another consideration that plays an equally important role, is the actual hardware required to access, perform, and illustrate the information, communication, and actual tools, e.g., flashlight, available through a smartphone. More importantly are outside technologies that assist with the smartphone sometimes referred to wearable technology. Wright and Keith (2014) article *Wearable technology: If the tech fits, wear it* explains that currently usable wearable technology consists of smart watches or bracelets and bio-medical measuring devices. Google Glass is an aspiring wearable technology but as of yet has not gone mainstream (Wright & Keith, 2014).

One area of wearable technology is power production. Conceptually, solar panels sewn onto clothing or a backpack in order to allow hardware to charge while running applications that produce information in an active environment are considered wearable technology. Unfortunately, current peer reviewed research with these types of literal

applications are very limited, with most of the current formal research focused on wearable technologies in the field of biomedical applications. For the purpose of this study, the limited formal research in wearable technologies is primarily sourced through the information available from the current uses in the biomedical field, and how these technologies might cross over into the field of education. Furthermore, certain questions surface concerning ethical practices of how wearable technology information could be used and how breaches in privacy of such information could cause concern for the individual user (Gaff, 2015).

For the most part wearable technology is not new concept. The *2013 Horizon Report* explained that early forms of such technology appeared in the 1970s in the form of calculator watches. What has changed are the uses of complementary and/ or converging technology that can accompany these innovations: Cameras built into clothing that upload pictures to social media sites to decorative solar panels built into shirts that charge batteries and power mobile smart technology. There is also a convergence of high tech materials and technology where fibers can be interwoven into clothing that allows for functionality way beyond warmth and moisture wicking properties.

Heart rate monitors help athletes, as well as average people train for a multitude of activities that require increases or decreases in vitals. The technology generally consists of a chest strap and wristwatch that is calibrated based upon weight, gender, and height. From that point, the watch would collect information, such as pulse rate and convert that information into calories burned, maximum and minimum heart rate, and time of exertion. Downloading this information helps to establish baselines of

information, and assisted in a nutritional plan, as well as a complementary program to prepare for these endurance activities. Today, this same technology is coupled with GPS, and social media information, which allows status updates. It allows athletes the ability to follow other participant's progress through a competitive interface, which is free on the Internet (Wright & Keith, 2014).

I have observed new innovations in helmet design allow athletes to use audio devices built into their snowboard and bicycle helmets to communicate with other participants, track progress, and give feedback on performance. One day, this same technology could soon be implemented in sports, where blunt force trauma is prevalent, allowing researchers a better insight into how to protect these athletes.

Distributed Inferencing with Ambient and Wearable Sensors (Atallah, McIlwraith, Thiemjarus, Lo, & Yang, 2011) describe the current status of miniaturized sensors interwoven into clothing, and the ability to collect and analyze data, and monitor activities using both wearable and ambient sensors. Wearable sensors capture movement, while ambient sensors “infer the context of those movements” (Atallah et al., 2011). The applications vary from monitoring of the environment to that of checking physiological parameters, such as heart rate. Additionally, this form of wearable sensor networking research is allowing for new innovations in adaptable interactive environments, such as smart homes that change depending on changes of the user's needs. Some of the current drawbacks to this technology include: sensor range, limited stored energy, changes in geographical environment, and multi subject identification (Wright, & Keith, 2014).

An example of how this technology might work in a home environment would include sensors that can tell whether or not you are inside a particular room; usage

sensors detecting television, phone or appliance usage, door usage sensors and sensors for activity and posture. Computer mapping is then used to establish routines. The authors believe that future research in this field will be beneficial for behavior profiling and ergonomic design (Atallah et al., 2011).

Imagine headbands that can monitor brain activity through the use of sensor technology, it is not so farfetched to imagine educational monitoring systems that record such activity, and give feedback on the success or failure of differing instructional method. This type of feedback would allow instructors to individualize lessons for the best outcome of each particular student. Applications that may be closer to reality include devices such as Google's "Project Glass," which uses visual information and augmented reality to give the user information about his or her surroundings. Adapting this technology to an outdoor educational setting could allow participants a new dimension of gathering and deciphering information. For example: A day hike through a historical mining site would now be complemented with personalized information augmented through Google Glasses allowing for a unique experience for each hiker based upon predetermined interests.

Smart Wearable Systems: Current Status and Future Challenges (Chan, Esteve, Fourniols, Escriba, & Campo, 2011) explains how a smart wearable system (SWS) is impacting the areas of academia and industry, especially medical research, with a primary focus on care for the elderly, but also including infant respiratory situations, and military battlefield situations. These SWS come in an array of wearable and implantable devices, capable of monitoring vital signs such as: temperature, heart rate, blood pressure, oxygen levels, electrocardiograms, and respiration rates. These types of SWS allow physicians to

monitor patients in real-time during their normal life activities. SWS currently have the capability to measure physiological, biochemical, and motion sensing. Concerns include: user needs, user acceptance, privacy, ethics, legality, effectiveness, cost, psychological and social issues, hardware and software, implantation site, and unconstructiveness. This technology has opened new avenues for pharmaceutical companies, who now have an opportunity to become more accurate with prescribing, and converge different treatments catered to the individual becoming more efficient and effective. Chan et al. (2011) believes that for this technology to make the next big leap, more integration into fields other than the medical field will be required. Finally, the most important challenges that must still be addressed are: smart signal processing, data analysis and interpretation, communication standards, component efficiency, and energy supply (Wright, & Keith, 2014).

Medical research, education, innovations, and practice will be forever changed with wearable technology that continually monitors all aspects of an individual's physiology. Such technology will deliver information to a doctor who then makes micro adjustments to the wearable item delivering any needed supplements, medication, or alerts an individual to come in for consult (Sultan, 2015). In the future, this same technology will allow parents and schools to monitor individual nutritional intake of students and make adjustments to menus and habits to maximize functionality at the cellular level so that every student will have a nutritional advantage for school performance. Extended further this type of information could be extremely valuable for individuals participating in outdoor events that require high levels of nutritional intake to remain safe and efficient.

In An Overview of Smart Technologies for Clothing Design and Engineering (Tang & Stylios, 2005), the authors describe a convergence between clothing design, engineering, and science in the development of smart clothing. Expertise in the aerospace, civil engineering, automotive, and medical industries coupled with advances in performance and fashion wear are helping to create new smart technologies in clothing. The idea of smart clothing includes materials that respond, control, or act in a predicted manner to the environment, reacting mechanically, thermally, chemically, magnetically, or in other forms (Tao, 2001). The U.S. military is a major player in smart clothing commissioning research for body armor, artificial muscles, physiological monitoring, and wearable electronics for communication. Adidas is one of the leaders in commercialized wearable technology, creating a shoe with microprocessors and motors that adjust cushioning. Conductive materials that carry electrical conductivity allow for the transfer of electronic information and energy as supplies for other embedded technology. Growth in this market segment is expected to go in different, but consistently converging ways including: performance driven smart clothing, continuous monitoring smart clothing for rehabilitation, military use, and fashion design smart clothing with an emphasis on effective appeal. Some of the foreseen issues include: weight, durability, cleaning, and cost. The integration of current technologies will also help speed the time in which wearable technologies arrive to market. Adapting sensors, conductive materials, solar power and electronics will aid in the speed of innovation.

Psychomotor skills could be enhanced by wearing self-correcting materials that not only provide greater sensation, but also enhance or restrict movement based upon instructional protocol for a particular lesson. An example for this might be, an

architectural or engineering design where an incorrect element is drawn, and a wearable glove corrects the mistake while an interface instructs the student why the element was incorrect, and why a change should be made. Imagine the impact on students with poor handwriting. There are already evolving wearable technologies for people with disabilities. In the very new future, wearable technology will allow students with certain physical disabilities to accomplish tasks never thought possible.

As wearable technology advances questions of ethics began to become apparent. First, some wearable technology is dependent on personal information. Take for example Google's Project Glass; these augmented reality glasses shows information based upon what Google knows about you, where your friends are, eating preferences, entertainment preferences, and your exact location (Gaff, 2015). It would be reasonable to assume that a user of this technology consented to the use of such information, but who might else have access to this private information?

Revelation

During the second to last day of the trip, I was hiking over roots and rocks that were saturated by the onslaught of rain and sleet. I noticed that even though the roots and rocks were in the same physical environment which I had crossed over 150 miles, I found that I had become accustomed to my feet slipping and sliding in every direction with no effect on my balance or progress. I began to think about this as the dimensional effect of learning in an outdoor environment, and began to think about the connections of how applications are adapted for different uses, and how over time, the user begins to master the information, interweaving it with experiences, and other information gained through these applications. My experience led me to understand that learning in an outdoor

environment is hands-on and happens in real-time. The single experiences fit well with Kolb's Experiential Learning Theory because during each event I entered into one of Kolb's stages in which a correlation could be drawn from the stage of the event to the theory. While this fit worked well for individual experiences, I was building upon each experience to the point where I was first gaining ability, then comprehension, moving to mastery of the subject. This progress of scaffolding fit well with Vygotsky's scaffolding if I replaced the notion of a human facilitator with the facilitation of augmented learning through the iPhone and its apps.

Using apps and smartphone technology augmented the outdoor learning experience, but also led to what I define as a fourth dimension of Mobile Learning, where the connections between the information, the emotional affect, and the physical experience enhance the process, and efficiency of future learning. Reaching the pinnacle of the Nikolaeff's Model of Outdoor Education using Mobile Learning I experienced indirect connections interwoven between experiential events and the psychological perspective aided in my ability to provide clarity through confidence in my learning and decision-making. For example: Looking at and understanding a topographical map in two dimensions or a model of the same terrain in three dimensions will give an experienced hiker an idea of time, distance, and effort needed to cover a prescribed distance. Using that same information, and introducing it as information gained through smartphone technology, while incorporating other apps, e.g., nutritional consumption apps, information on the emotions of survival, and/or weather forecasting, moves the future experiences beyond the current physical environment, and introduces elements which are yet unforeseen, all while in a three dimensional learning environment.

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APPENDIX A
METHOD

Method

This study applies a qualitative autobiographical narrative (Bullough & Pinnegar, 2001; Clandinin & Connelly, 2000) approach in order to capture a storied account of the experiences used for investigating mobile application use in an outdoor education experience.

Participant

The participant for this study is also the researcher. While other characters are talked about in the narrative, they are experiences of the participant-researcher and from an autobiographical perspective. No other subjects are involved with the research study. The participant is not from a vulnerable population and is engrossed in the study, as he is also the researcher.

Researcher Stance

Because of the nature of this study, qualitative autobiographical narration, it was important to understand that as both research and participant I would need to separate myself and record information as a participant first, while reflecting back on my experiences from a researcher's point of view (Bullough & Pinnegar, 2001). I believe that this approach narrowed the ability to generalize much of the information that was gathered, but that because this field was understudied and very little had been published, there was a need for an approach that developed themes that could be further explored and expanded upon. I further acknowledge that as participant and researcher much of the information in this study is open to researcher bias. In many examples the exact situation or circumstance in which outdoor education using mobile learning can not be exactly re-created. I also maintain that I had found preferences in the types of material or information that was available at the time of need in regards to the applications that I

preferred. For example, I found that my need for understanding my mental state was one of the greatest needs I faced early on, I tended to look for information in regards to other needs using the application that first addressed my mental state and only looked to other applications if an answer could not be found in this original app.

When deciding to proceed with this type of study I had felt that it would be important to approach my research from a novice position. Up until this point I had very little knowledge of backpacking or surviving in an outdoor environment. My previous knowledge was limited to camping with a vehicle close by, and day hikes primarily on well travel routes along the front range. I did test my equipment such as setting up my tent, learning how to start my stove and I was advised to carry bear spray in case of an interaction with wildlife. I reviewed instructional information on the stove and bear spray by watching Youtube videos previous to beginning my journey, and was unable to access such videos during my study due to connectivity issues. Physically, I was not prepared for the rigors of backpacking and was ill-prepared to carry an overweight pack.

Epistemology played a role in deciding whether or not learning had taken place. Instead of choosing one philosophy I felt that it was important to look at three primary ways in which knowledge could be gained, Behaviorism, Cognitivism, or Constructivism in the form of discovery learning. It was my thought to keep this option open because of the differing scenarios that could take place. It is my belief that different learning theories can be used to explain learning outcomes, and that by choosing only one theory I may be limiting the way in which the learning occurred.

Design

The design was an autobiographical narrative (Bullough & Pinnegar, 2001; Clandinin & Connelly, 2000) in which the researcher, myself, entered into varying

outdoor settings and survival situations in order to explore how using information from a smartphone via applications, connected interface, or public sourcing supported learning in an outdoor environment. The decision to approach this study as an autobiographical narrative construction (Bullough & Pinnegar, 2001; Clandinin & Connelly, 2000) was due in part to the need to develop general themes to add to the literature that could be expanded upon both quantitative and qualitative studies in the future. Little research on outdoor education and m-learning exists. Prior autobiographical narrative studies helped support my development of the study design:

Being inside the whale is one aspect of the autobiographical connection with ethnographic research. Another is being part of one's own research process. In this, the researcher explicitly sets out to investigate how particular processes (like decision making and creativity and making sense of experience) take place, and include himself/herself as a protagonist. (Daskalaki, 2012, p. 431)

I backpacked over several segments of the Colorado Trail in order to gauge the usefulness of the information I could access about survival and whether or not this information would lead to successful learning facilitated through mobile devices in an outdoor learning environment. The experiences, including psychological and educational outcomes were recorded by the participant using field notes, photographs, audio, audio/video, and short narrative posted at: <https://www.facebook.com/#/>. While all forms were used, some were used more than others because of the mishaps with connectivity and equipment malfunctions. Field notes and photographs became the primary sources of data collection.

Narrative construction using an autobiographical approach (Bullough & Pinnegar, 2001) were used in order to share the rich details of the experiences of outdoor learning. The wide variety of applications and complementary tools available as mobile resources

applicable to learning in an outdoor education environment is under-researched and narrative construction provides an easily accessible base of knowledge to broaden the literature. The expansive spectrum of technology in mobile learning coupled with outdoor environments creates a unique opportunity to study an extremely popular forum in which the primary characteristics change at a very rapid rate. Narrative inquiry from an autobiographical frame of reference was chosen as the procedure for study based on the idea that a baseline or benchmark must be established for future qualitative and quantitative studies (Bullough & Pinnegar, 2001). The autobiographical narrative approach allows for a complete participant understanding of all aspects of the educational experience:

Much of contemporary interest in autobiographical analysis lies in its mediational role, its capacity to intertwine theory and experience. By employing autobiographical methodologies, we can understand how our academic “characters” fit the plot of our personal life and how our experiences as practitioners in/transform the plot of our academic scenarios: the academic-practitioner will create meaning out of experiences taking into consideration historical and institutional discourses that render these experiences and meanings relevant to engaging audiences. (Daskalaki, 2012, pp. 431-432)

By acting as both researcher and participant, emotions, thoughts and cognitive and physical experiences can be discovered that may be overlooked if I were to only observe others participating in this environment. For example, even if a researcher is embedded with his subjects, like in an ethnographic study, the researcher is still separated from emotions and feelings as the participant. This study depends on an individual understanding of technology and an individual’s ability to conceptualize the need for knowledge coupled with the ability to draw from a mobile learning tool for survival as a novice in a complex outdoor environment.

Data Collection

In order to allow for greater accuracy of data collection and to increase the role of the participant as the outdoor learner, recordings of all situations where outdoor education using m-learning were attempted with video and audio recording devices. However, challenges from equipment malfunctions, power surge of the GoPro Hero, impacted the ability to collect data. Data were collected as reflective field notes, audio, video, and the short posted narratives on Facebook when conductivity allowed. These data are intended to capture the story that unfolds during the outdoor experience. Analysis of these data will take place as part of a recursive, dynamic process. Although some analysis will take place throughout data collection as I reflect on the experiences during the outdoor experience. This study will follow an inductive and comparative process in which the researcher is continuously looking for patterns in the data that will later lead to emergent themes.

There is no need for special protection of the recorded data because the participant is the researcher and vice versa.

Data Analysis

The data were reviewed and organized in groups, and each was given a meaningful code (Creswell, 2014). In addition, an analytic strategy was used to allow reflections and ideas to develop to draw ideas, take my notes, brief the notes, identify codes, divide the codes for the groups, and order the groups' analytic framework as it connects with the literature. Then, the narrative and interpretations were written to explain the findings from the data analyzed (Creswell, 2014).

Limitations

This study was narrative autobiography and is intended to provide one perspective of a lived experience. It is limited in scope by design and is not intended for generalizability to other individual experiences or populations, regardless of similarities in participants. Even though the participant is a novice to outdoor learning, some educational, environmental, and personal life experience shape the perception and interpretation of data, again only allowing for a finite generalizability of results.

The first limitation is the use of autobiographical narrative in order to develop data that can be used for future studies. In most of the examples that I explored, autobiographical narratives were done as reflections of past experiences. For this study, I chose to enter into experiences and then reflect on whether or not learning had taken place. Because I as the researcher was reflecting on my own experience as a participant, I may not have always been as objective as if I were independent from the combination of researcher/participant. One advantage was the ability to have experienced the learning from a first person point of view, but this is also a limitation in that there is no second or third source to verify the narrative.

The second limitation is the actual outdoor environment in which the study occurred. It was this author's intention to study outdoor education and m-learning using several segments of the Colorado Trail, in either a continuous collection or separate segments over a period of time, in order to cover a diverse environment with differing technological and educational hurdles. Because this was an almost infinite environment, where outdoor education using m-learning could occur, the results could not be generalized to every situation or environment. The best hope was to accomplish a starting

point for further researchers to study in this area, and perceive the future results to be a launching point for similar studies, both qualitative and quantitative. Because all data is collected from one reference point, the researcher was bound by the one perspective and relied on limited data input.

Maintaining power was one of the greatest unknowns before beginning this study. Even though enough solar panels were worn in order to cover the needs of equipment, environmental factors and a lack of knowledge was not suitable for maintaining a sufficient power source. Overcast skies or heavily wooded areas hampered power collection, and length of time in unexposed areas as well as inexperience with the system also curtailed power collection. The manufacturer of the solar power system I used estimated 10 to 20 hours of sunlight to fully charge the battery system that would charge the iPhone. I found that the battery could charge my iPhone in approximately 40 minutes in airplane mode and within two hours in regular mode, but with no WIFI or Bluetooth on. As mentioned before, phone and data coverage is limited in mountainous areas and has been documented through personal experiences, for example, Tony Bradley of PC World wrote, "Much of our trip involved mountainous territory, which exacerbated the problem. While a given area--like Denver--might have solid 3G or 4G coverage, whether or not you can connect to it depends a lot on your elevation and line of sight to the cell towers. When we drove up to the top of Mount Evans I had absolutely no signal most of the way up. Even standing in the parking lot at the top, I could not get a signal from Verizon. But, once I hiked up a hundred feet or so above the parking lot I suddenly had a solid 3G signal again" (Bradley, n.d.). Bradley points to the line of sight issue regarding cell signals and the issue this presents in mountainous areas. Others have pointed to the

populations having been too sparse for it to be economically feasible to put up towers, while others protest the sight of towers especially in wilderness areas and national parks limiting the number of towers needed for continuous service. This limitation will require forward thinking about issues, questions, and information needed as the participant runs across particular situations and then inquiries about useful information for use when the next time the situation arises. To overcome this limitation, static learning materials can be stored in the memory area of devices, which are available without phone or data services.

When connectivity was available, subject matter experts, such as friends and peers with outdoor backpacking experience, were utilized for public sourcing of information. The limitation to this type of information was whether the “experts” possessed qualified credentials of the information and whether they would respond in the limited time when a connection was available. There were a couple of responses from peers and friends, that had known what I was studying and responded regarding posts that were made on Facebook, but the information came too late to be useful. In addition, even though responders were knowledgeable about the type of information they are providing, they were not in the current environment of the participant, and did not have access to all of the real-world factors needed to make the response useful.

Context

The idea of researching outdoor education and mobile learning first occurred to me while taking classes and learning about the use of mobile applications and smartphone use. I was intrigued by the idea of using outdoor survival applications, while immersed in an environment where the applications could be useful. I felt that such research could benefit several areas of learning where traditional methods where either

unavailable or possibly too cumbersome to use, e.g., survival manuals or access to outdoor learning via libraries or other resources. After reviewing much of the material regarding outdoor education and mobile learning I found that there was little if any research that showed that mobile learning in the form of applications on a smartphone were studied, or published. Much of what I found revolved around medical applications or technology focused primarily on narrow fields such as accident avoidance. The benefit of what I hoped to accomplish would be a starting point for further research in several applications such as outdoor preparedness, military survival, filling the gaps of knowledge of outdoor education in real time, and the usefulness of fluid and static application information. This study shows that there are several opportunities for further research and an expansion of literature in the areas of mobile education connectivity in rural environments, the usefulness of static applications where connectivity is not possible, the unforeseen concerns of the mental aspects of survival in outdoor situations, and the ability to learn from the information that mobile applications provide while understanding the limitations of such information.

The following research questions guided this study:

- Q1 How does the increased access to smartphones and smartphone technology influence an individual's ability to use mobile learning for outdoor education?
- Q2 As an individual gains knowledge through mobile learning (m-learning) for outdoor education, will the information or knowledge transform to be adapted beyond its original purpose?
- Q3 How do environmental factors affect an individual's ability to learn using mobile applications?

Nikolaeff Model of Mobile Learning in an Outdoor Environment

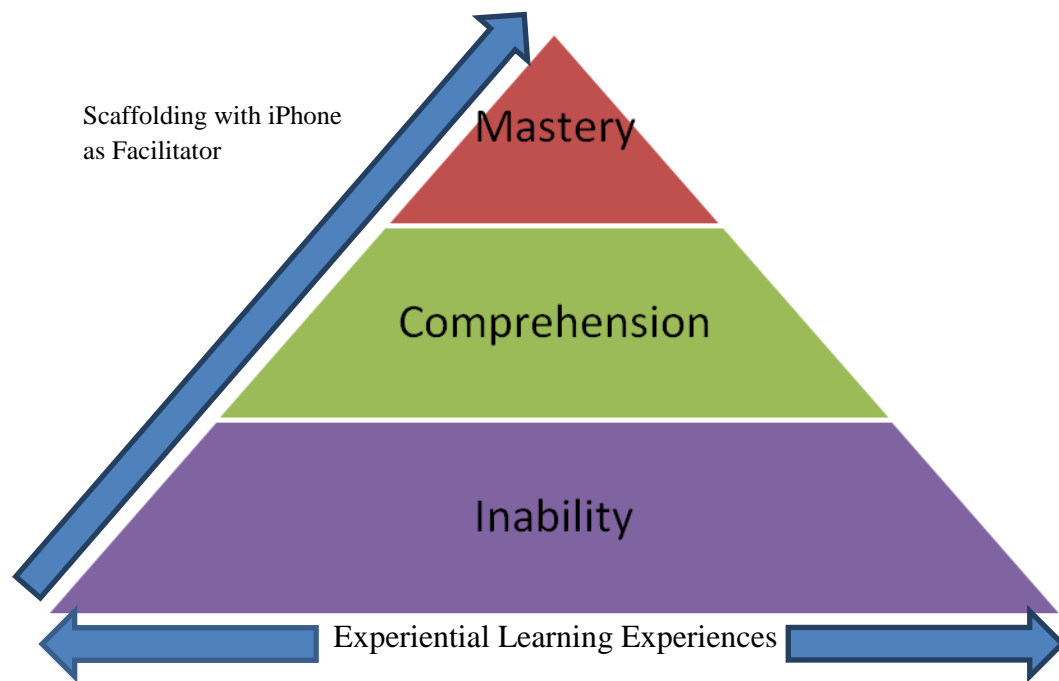


Photo 16. Nikolaeff Model of Outdoor Education Using Mobile Learning. Ivan Nikolaeff (2014).

APPENDIX B
INSTITUTIONAL REVIEW BOARD APPROVAL



Institutional Review Board

DATE: August 26, 2014

TO: Ivan Nikolaeff
FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [648994-1] MOBILE LEARNING IN AN OUTDOOR LEARNING ENVIRONMENT: AN AUTOBIOGRAPHICAL NARRATIVE USING APPLICATIONS BASED INFORMATION AND RESOURCES

SUBMISSION TYPE: New Project

ACTION: APPROVAL/VERIFICATION OF EXEMPT STATUS

DECISION DATE: August 26, 2014

Thank you for your submission of New Project materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

Ivan -

Thank you for a clear and brief IRB application narrative. I have no requests for revisions or amendments. If your research process changes in any way such that it involves information from other individuals as data sources (e.g., comments in response to your Facebook posts) please be sure to amend your IRB application to include consent forms to ethically obtain access to use others' data in your research.

Otherwise, best wishes with this interesting project and don't hesitate to contact me with any IRB-related questions or concerns.

Sincerely,

Dr. Megan Stellino, UNC IRB Co-Chair

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.

APPENDIX C

PILOT STUDY MAXWELL FALLS

Pilot Study Maxwell Falls

On August 22, 2013, I successfully climbed Maxwell Falls outside of Evergreen, Colorado using information gained through an iPhone 4 and a 16MB iPad 2 with no Wi-Fi accessibility. Up until this point, I had memories of about half a dozen climbing or hiking expeditions, all day trips including the summiting of two of Colorado's fourteeners; Mt. Beirstadt, and Mt. Evans, both on different days and two years apart. My hiking and climbing experience is novice at best, limited to knowing the following:

1. Carry plenty of water and stay hydrated
2. Be off the top of a mountain by 2:00 p.m.
3. Bring extra layers, a rain jacket.
4. Wear comfortable shoes
5. Let someone know where you are going
6. Stand up to bears
7. Wear sunscreen

Pre-trip

Before selecting a location, I previewed several apps for outdoor use. Most outdoor apps are used as narratives for locations, much like a travel magazine or tourist guidebook. Some apps focus on specific tasks or skills, i.e., boating, fishing, or knot tying. One app I was interested in was MapMyHike, having used a similar app MapMyRun in the past. This application allows the user to track their distance and route through the phone's GPS. Other features include:

Profile -- Which may include your profile picture, a user name, last workout including mileage and date, total time, and total distance. Along with my goals which

must be entered at a computer, and my stats which include user name, profile picture, e-mail address, gender, height, weight, and birthdate.



Photo 17. MapMyHike Profile Page [iPad Screen Shot]. Ivan Nikolaeff (2014).

Routes -- Which include my latest hikes, mileage, a map of the route covered, place, and elevation gain.

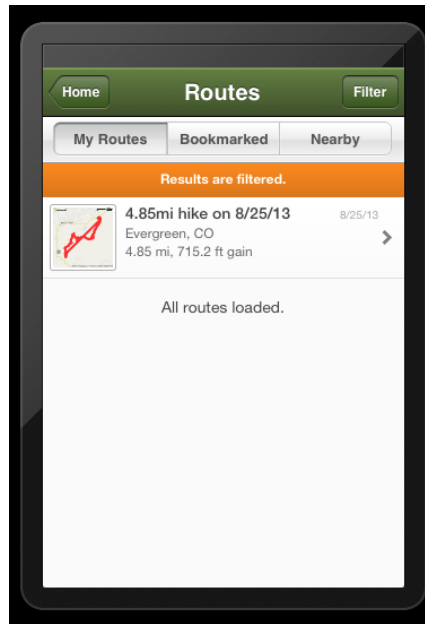


Photo 18. MapMyHike Routes Page [iPad Screen Shot]. Ivan Nikolaeff (2014).

Workouts -- a summary of previous hikes including date, mileage, total time, and average time per mile.

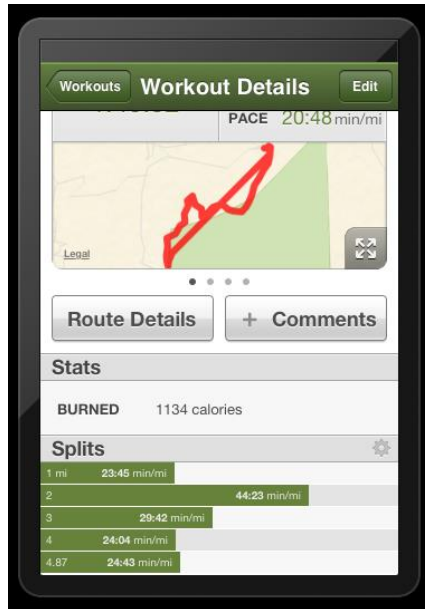


Photo 19. MapMyHike Workout Page [iPad Screen Shot]. Ivan Nikolaeff (2014).

Friends -- This feature allows the user to see friends that are live on social networking sites such as Twitter and Facebook.

Live -- This is a paid feature, which I did, not purchased at this time. Features unknown.

Nutrition -- This feature allows the user to log types of food and beverages, along with calorie content, log beginning and ending weight, water consumption, and set overall physical stats.

Upgrade -- Allows the users to upgrade to a full version of MapMyFitness for a monthly subscription of \$5.99, three months for \$17.99 or yearly for \$29.99. The subscription eliminates pop-up ads, adds training plans, iPod controls, live tracking,

camera with GPS, advanced maps, interval training, mobile coaching, heart rate analysis, power analysis, advanced leaderboard filters, and custom splits.

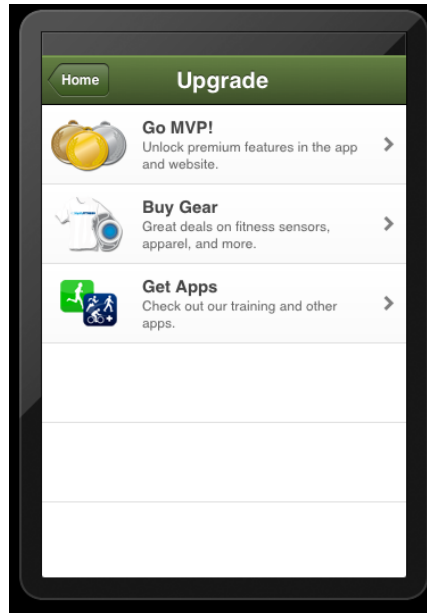


Photo 20. MapMyHike Workout Page [iPad Screen Shot]. Ivan Nikolaeff (2014).

Settings -- This feature allows the user to control distance units, voice feedback, push notifications, record countdown, split distance, auto pause, keep screen on, social postings for Twitter, and Facebook, heart rate monitor, bicycle tire size, un-synced workouts, and has information about the application.

FAQ -- Questions and answers regarding general features and feedback for MapMyFitness.

Two other applications were downloaded and briefly reviewed for relevance they included iSurvival and iTrack Lite. iSurvival was only available for the iPad which could make it cumbersome to carry and reference quickly. Additionally, iSurvival is basically a PDF copy of a survival manual with little interactivity other than flipping from the table

of contents to a particular chapter. Although, after a quick review it did have useful information that I had not yet discovered in other applications. Because it is strictly a PDF of information, the content is readily available without having a concern about connectivity.



Photo 21. Screen Shot of iSurvival Chapter Page. Ivan Nikolaeff (2014).

iTrack Lite is an application that displays several pictures of animal tracks and gives a description of an animal, including several other distinguishing characteristics such as scat, claw marks, and displays of behavior and anatomical makeup of the animal. Several pictures are included for each animal along with information and recommendations. A Wiki tab allows the user to gain further user sourced information.



Photo 22. Screen Shot of iTrack Lite Paw Recognition Page. Ivan Nikolaeff (2014).

I chose the location based upon the proximity to Denver, the length of the hike, difficulty level and elevation gain. These factors seemed to give a reasonable amount of diversity in order to capture varying amounts of information regarding outdoor education and m-learning.

Concerning equipment, I decided to wear running shoes with low athletic socks hiking shorts with cargo pockets and a t-shirt. Additionally, I carried a large Jansport daypack with a hydration bladder, raincoat, four bottled waters and two protein bars. For this excursion my wife, Jamie Nikolaeff came along and assisted by calibrating the distance using a different GPS tracking application on her iPhone 5. Before beginning the hike, we applied bug spray and Jamie added sunscreen.

The Approach

The initial phase driving to Maxwell Falls and when arrived had some anxiety. Generally, I do not have any concerns or apprehension when it comes to outdoor activities. While driving to the site I was concerned over the idea of separating participant from researcher, and how and when to record data, what the data might look like, and remembering to capture external information that would help lead to a greater understanding of the narrative. In the end, I found that an epiphany would take place that would lead to a greater understanding of the entire project.

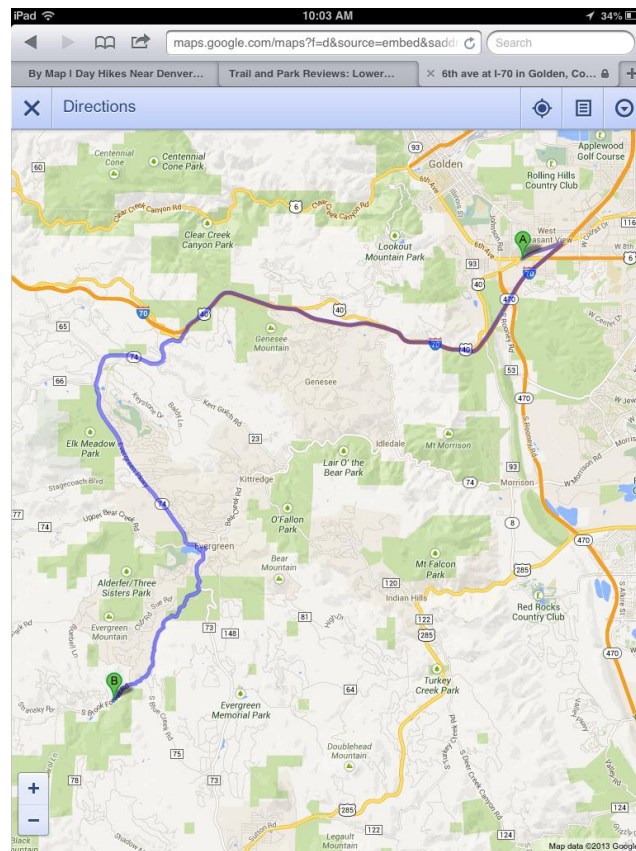


Photo 23. Screen Shot of Google Maps: 6th Avenue at I-70 in Golden, Colorado. Ivan Nikolaeff (2014).

Upon arriving at the site my first instinct was to apply bug spray. As I stepped out of the vehicle to apply the spray, I noticed that there were quite a few cars in both the upper and lower parking lot of the Maxwell Falls parking area. There is a Maxwell Falls upper parking area that provides a shorter hike, but we chose to park at the lower lot to provide the longer hike. I hate bug spray, and sneeze for anywhere from 30 seconds to several minutes each time I apply it. The can I grabbed at home is especially unforgiving to my olfactory sensors in that it is extremely strong, OFF Deep Woods. Upon application, I begin to sneeze heavily for some extended period of time. After completing that unpleasant task, I gathered the backpack collect my shoes and socks from inside then put them on. Because I have done some distance running in my past, I have learned to wear flip-flops when I am not engaged in an athletic activity that involves extended periods of time on my feet. This helps to cut down on swelling. Looking at my shoes, as I put them on I wondered how they would fair with comfort, and primarily traction. They are ASICS road running shoes are not the best hiking shoe. Once we have situated water and snacks in the pack, I strapped it on and we began our journey towards Maxwell Falls. At this point, I started MapMyFitness.

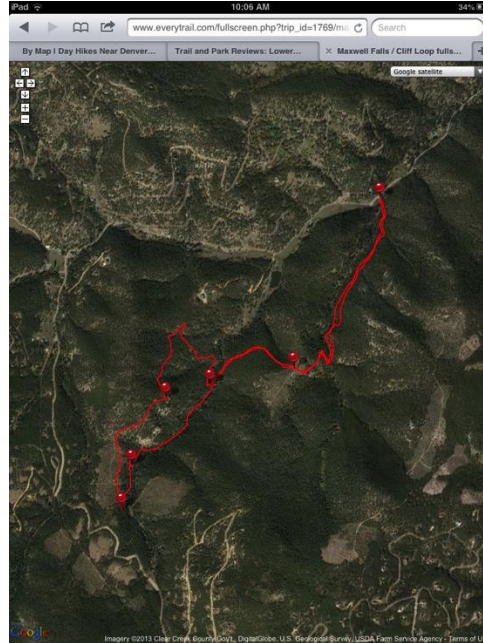


Photo 24. Screen Shot of MapMyFitness: Satellite View of Hike at Maxwell Falls. Ivan Nikolaeff (2014).

Mile 1

For the first mile, my primary concern becomes hydration and the thought of edible plants. With this thought, I begin to snap photos of berries, plants, trees, and running water with the idea of posting these photos on a social networking site to test public sourcing feedback. I think that this would provide valuable outdoor education information with live or just-in-time m-learning. If appropriate and if group sourced information is accurate this type of information gathering would help to provide quick information in emergency or survival situations. About 500 yards into the first mile, I noticed a plant with red bulbs that look similar to a small red radish. I snapped a picture

with the idea of posting the picture on Facebook to try to use public sourcing to gain information.



Photo 25. Maxwell Falls Vegetation Photo. Ivan Nikolaeff (2014).

During the first mile, the trail simply gradually goes up and my calves began to feel like I have climbed several floors of stairs. Worse than the early physical strain is the fact that my left heel rubbing hard against the back of my shoe. I knew from experience that I needed to adjust my sock or shoe in order to stop a blister from forming. I stopped and made what I believed to be the necessary adjustment to not form a blister. While stopped, I made a mental note as to the struggle the first mile had been, and that I needed to drink water early to keep from becoming dehydrated. Also, we reached an altitude where mushrooms seem to be becoming more prevalent, so I made sure to take pictures to see what others might think about the edibility of the different mushrooms.



Photo 26. Maxwell Falls Running Water Photo. Ivan Nikolaeff (2014).



Photo 27. Maxwell Falls Running Mushroom Photo. Ivan Nikolaeff (2014).

Mile 2

As we began mile 2, the trail continued to climb higher during the first quarter and then leveled off to begin a slow gradual descent down to a stream. Again, one of my primary concerns at the beginning of the hike was hydration. I knew very little about the safety of outdoor water sources, but I do know that water should be boiled, or I could use iodine to clean up bacteria due to contaminated stream water. I believe that in some circumstances, running water is safe to drink, but I am unsure of the conditions so I took

a picture of the water, and a 10-minute video to post on Facebook for feedback. About halfway through mile two, we reached a confluence of trails, one is called Cliff Loop, which travels in right angles to the Marshall Falls trail we were currently on. At this junction, I see an odd plant that if I remembered correctly is called Indian Toilet Paper. I photographed it for later information, because it could be a miserable mistake if needed. Towards the end of mile two, we reached Maxwell Falls. There were several hikers, their dogs, and their children finding places amongst the rocks to rest before descending down. After conferring with our GPS system, I knew I had a problem. At some point in the last half to a quarter mile MapMyHike paused itself, and when I un-paused it, it drew a straight line from the parking lot to my current position. My first thought was that this could be a major problem if I was dependent on this application to retrace my steps.



Photo 28. Maxwell Falls Trail Sign Photo. Ivan Nikolaeff (2014).



Photo 29. Maxwell Falls Indian Toilet Paper Photo. Ivan Nikolaeff (2014).

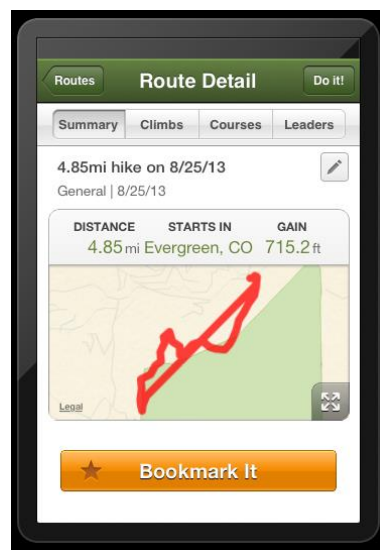


Photo 30. Maxwell Falls MapMyHike Straight Line Photo. Ivan Nikolaeff (2014).

Mile 3

At Maxwell Falls, we decided to continue up to where we could meet up with Cliff Loop and then descend back down to the aforementioned confluence and back onto the Maxwell Falls descending trail to the parking lot. At this point we were both tired, but not to physically strained with the exception of the blister that I felt growing on my heel. I do want to point out that my wife wanted to eat our protein bars right then instead of when we summited the next trail, but I pushed her to summit the next trail first.

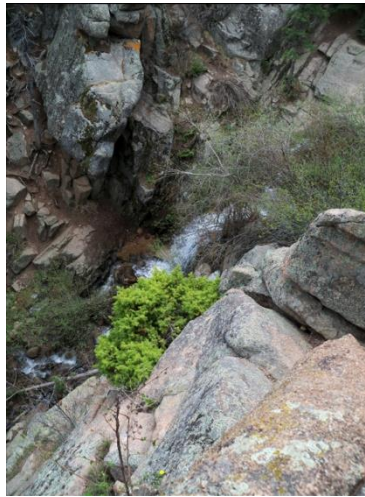


Photo 31. Maxwell Falls Cliff Photo. Ivan Nikolaeff (2014).

Mile 3 began and continued to be steeper than any of the previous trail, and with each step, I felt labored, and my calves and ankles were extremely tight. Tight to the point that they felt they would snap if something caused them to suddenly stretch. During mile three, what I recognized as wild raspberries were in abundance. Again, I am not sure how safe they are to eat, and I was nervous that they were located so close to the trail and were probably soaked twice a day by dog urine. As we climbed higher, I began to notice that I was needing to move more of my mental faculties to sustain my physical activity,

and that I no longer could make the general observations I made earlier. At one point, there was a strange plant like a thin bamboo growing next to the trail, and I made a conscious decision to wait for another chance to photograph it, a chance that never arrived.



Photo 32. Maxwell Falls Wild Raspberry Photo. Ivan Nikolaeff (2014).

Mile 4

At some point mile three became mile four and during the transition, I became fixated on something I had seen in the iSurvival app: how to make stone tools. Between about mile 3.75 and 4.25, I began to look for certain types of rocks that could be fashioned into a head of a hammer or a spear tip. This was a bit odd, because I only glanced at pictures for forming these tools on the iSurvival app.



Photo 33. Maxwell Falls Arrowhead Photo. Ivan Nikolaeff (2014).

Just after crossing into mile 4, at about 4.1, we reached the confluence of trails. Cliff Loop continued on for an unknown distance, and Maxwell Falls went in the two directions adjacent to the loop. At this point something very interesting happened, we had no idea which way would lead us back to the parking lot. We were exhausted, and not completely mentally attentive. Here is the interesting part, I had photographed the Indian Toilet Paper with my iPhone. Even though it grew on three of the four sides of the confluence, the pattern of the plants from the place where I photographed could not be replicated. When I pulled up the photo, I knew I had shot the plants to the right of me before reaching the confluence of trails. The same plants soon came into focus to my left, allowing us to have established a mobile learning landmark using the photo I had taken earlier.



Photo 34. Maxwell Falls Pine Tree Photo. Ivan Nikolaeff (2014).

The final .98 mile of the hike was very tiring, but the gradual downhill slope was easy. Coming down this last stretch, I refocused my mind on finding plants for medicinal purposes, to help with my fatigue, the blister on my heel, and the soreness in my legs. I took more photos of more well know plants and trees, i.e., evergreen trees, hoping to learn through post mobile app research or public sourcing that these may have some useful properties.

As we approached the car, I checked MapMyHike to see what exactly had been recorded. It was at this point that I discovered the difference in distance between the app I had been using and the running app my wife used to track the mileage. Also at this point, I spotted my first form of natural protein, took a picture and wondered if anyone on Facebook or any iPhone application could tell me if it was safe to eat.

Mile 4.98

I settled into the passenger seat of the car, and reviewed my photos and notes. It became immediately apparent that a more fluid form of gathering information, data, photos, and notes would be helpful. Just the very nature of fatigue and the effect on data

collection is a concern, which I will need to address in the next pilot study. Further thoughts led me to the decision to setup and post some information on a social networking website. For this, I chose Facebook, and setup a page called Ivan's Outdoor Education & Mobile Learning Research: facebook.com/IOEMLR. Examination of my physical being showed a blister of about three inches in diameter, slight dehydration, and some soreness in my legs and ankles. I was surprised to find that my upper body was not fatigued considering this was the first time in a long time I had carried a mid-sized pack.

After arriving home, I began to reflect on the experience and how apps, features and in the future public sourcing affected or may affect my learning. Since a majority of my thoughts were focused on food gathering and hydration, I began to further explore some of the applications I had downloaded. Right off the bat, I found a process for testing plants that would have been very valuable given my interest during the hike. I noticed that during and after my initial review of the information from the app iSurvival, I had an intense attention span, and was able to process and memorize information more quickly, and with greater detail than I did with previous reviews of app information before the hike. Now I have an immediate reference for testing wild plants for nutritional or medicinal purposes, and a strong correlation as to when this knowledge would be used in an outdoor setting.

Proposal Meeting August 24th

After meeting with Dr. Gall, some points became clearer and better processes were discussed for data collection and accurate recording of events:

1. There could be a confluence of technologies that leads to learning. For example: At one point during the hike a picture was taken of a plant for the purpose of

group sourcing on Facebook, but the picture turned out to be later used in order to gather information on direction, and to gather my bearings on which way to go. In this instance, a form of adaptive learning took place where the picture served a secondary purpose as an artificial landmark.

2. In order to better capture information especially when fatigued a more automated approach would be needed. Dr. Gall discussed using a constant video and audio recording that captured all information and narrated audio in real time. This could be done using a GoPro Hero camera or possibly an iPhone with mobile recharge capability, e.g., wearable solar panels. The iPhone option might also allow a live video feed through Facebook or an application, e.g., Map My Hike.

3. Dr. Gall asked that I forward a copy of this draft of my proposal to Dr. Lohr for feedback on the pilot narrative.

Pilot II The Bluffs: A Simulated Outdoor Situation

The purpose of the second pilot was to test the idea of using audio and video to capture more of the narrative and record details that could be lost while trying to capture all of the information needed in regards to this type of research. The simulated situation was one where an individual needed to climb to higher ground during a flood situation and my interest was in whether there would be information available via mobile media to help with directions, or information in such a case. Overall, the 40-minute pilot study failed, due to extreme weather causing malfunctions with the phone case and that the camera recording the incident was fully encased in a waterproof case, not allowing for proper sound capture. Also, traditional mobile apps did not allow for quick access to emergency information especially when the participant, myself, had reached a certain

level of need creating further anxiety. The following screenshots were taken from the video and it is especially interesting to see how the pictures begin to degrade as conditions became extreme:

Using an iPhone app called Live Stream I was able to produce a live video in which followers could provide feedback in regards to items and situations I was encountering. This screenshot was from Live Stream capturing a rattlesnake sign. Information that could be sourced from the live video might include what should be done in case of an encounter with a poisonous snake.



Photo 35. Rattlesnake Post. Ivan Nikolaeff (2014).

Live Stream works over WIFI, 3G, and 4G networks. It allows for video to be viewed live or recorded. This shot was captured as a thunderstorm entered the area. Anyone watching can comment or provide information as an event unfolds.



Photo 36. Oncoming Thunderstorm. Ivan Nikolaeff (2014).

While Live Stream offers a valuable tool for public sourcing, data coverage is limited and can cause the link to be disconnected. During this pilot only 2.5 minute was actually broadcasted even though I believed the entire event was captured. This video was shot in an urban environment and rural data coverage would be less reliable.



Photo 37. Dirt Trail. Ivan Nikolaeff (2014).

In addition to Live Stream, I mounted a Hero camera to my pack to capture audio and video narration. The audio was very poor due to the fact that I had the waterproof case on the camera.



Photo 38. Self Photo GoPro Mounted on Shoulder. Ivan Nikolaeff (2014).

The Hero camera allowed me to capture what I was experiencing, e.g., The Rattle Snake Sign.



Photo 39. Self Photo 2 GoPro Mounted on Shoulder. Ivan Nikolaeff (2014).

One important realization is that multiple camera angles could be valuable to capture different dynamics during the research. One possibility would be to have a second camera that could record the different applications and information that I was accessing on the iPhone.



Photo 40. Self Photo 3 GoPro Mounted on Shoulder. Ivan Nikolaeff (2014).

Capturing video and photos and then posting them via my research site on Facebook could provide valuable information using public sourcing for outdoor education, e.g., what plants are edible?



Photo 41. Public Sourcing. Ivan Nikolaeff (2014).

As conditions turned for the worst, I was unable to record a quick change into a rain jacket because I had to place everything on the ground to get into the backpack. There may be no solution to interruptions for these circumstances.



Photo 42. Quick Change. Ivan Nikolaeff (2014).

During this pilot study, I used an external portable solar panel to test the idea of charging on the go. While it slowed the drain on the iPhone, the cloudy conditions hampered the ability of the panels to charge. For my actual dissertation research, I would need alternative power sources or possibly more panels strapped to my pack.



Photo 43. Beginning of the Downpour. Ivan Nikolaeff (2014).

As conditions continued to degrade so did the video quality, but not to the point where the video would be useless, if anything it helps to lend credence to the situation.



Photo 44. Worsening Conditions. Ivan Nikolaeff (2014).

As the pilot progressed, the exercise conditions worsened and my anxiety grew. During the worst part of this storm, I worked on trying to access emergency information via the Web and local news agencies. Because of the alarm, I felt due to heavy rains and lighting, I realized it would be important for local agencies to push information out to users as opposed to a user trying to pull information. No such information was forthcoming.



Photo 45. Alarming Situation. Ivan Nikolaeff (2014).

Just before making a scramble to the car, I found that I had lost the ability to scroll between screens due to the condensation on the Life Proof case. A condition that must be taken into account for further research.



Photo 46. Scrambling. Ivan Nikolaeff (2014).

In review of this pilot, a few considerations needed to be taken into account. First, were the video and audio and the need for redundancy to capture information. Second

was the need for process and to have a general plan on what to do or how to proceed when confronted with situations that can create anxiety or worse panic. With that said during my actual research part of what is to be learned is what will not work.



Photo 47. Running with Anxiety and Panic. Ivan Nikolaeff (2014).

I conducted a third pilot study to test the audio, which was much more successful. I am working with the footage to see if it is possible to add narrated subtitles to the footage for a better understanding of the experience. If successful, I believe that a complete narrated version of my dissertation could be produced with audio and video including subtitles to capture supplementary information. At the conclusion, I would still have a fully transcribed hard copy version of my autobiographical narrative, but the audio video would help add to the experience and further capture information to help further the research.

The Facebook page I have constructed for public sourcing of this study is located at: <https://www.facebook.com/IOEMLR>.

APPENDIX D
EQUIPMENT LIST

EQUIPMENT LIST

Camping Gear

- Big Agnes one person tent
- Marmot 2.2 lb. sleeping bag
- Osprey 55 cubic centimeter backpack
- Jetboil Sol cooking system
- Generic sleeping pad
- Fire starter
- Headlamp
- 100 ft. of cord
- Backpacking pot, coffee cup, and spork
- 8 inch knife
- 1 small shovel
- 1 life straw (water purification)
- 2 rolls of toilet paper
- 2 small rags
- 1 pair of hiking poles
- 6 small bungee cords
- Water purification tablets
- Bug spray, suntan lotion, dish soap, body wash, laundry soap
- 1 Emergency kit (Medical supplies and Ibuprofen, Benadryl)

- 1 6'X8' lightweight tarp
- 1 3 liter water reservoir
- Bear spray

Food (Restocked Weekly)

- 3 Knorr's side dish rice and broccoli
- 4 cans of sardines
- 2 bags of beef jerky
- Powdered Gatorade mix
- 12 protein bars
- 4 cubes of chicken bullion
- 6 liters of water (refilled 2 to 3 times per day)
- Coffee grounds
- 2 hot chocolate packs

Clothing

- 1 pair of hiking shorts
- 2 pairs of underwear
- 2 pairs of socks
- 1 pair of swim trunks
- 1 wicking t-shirt
- 1 long sleeved t-shirt
- 1 light weight down vest
- 1 waterproof jacket
- 1 pair waterproof pants

- 1 bandana
- 1 pair of winter gloves
- 1 pair long underwear
- 1 pair of hiking pants
- 1 ski cap
- 1 long sleeved hoodie
- 1 pair of backpacking boots
- 1 pair of sunglasses
- 1 pair of Teva sandals

Technology

- 1 Apple iPhone 5s with 16GB of memory & waterproof Life proof case
- 1 Apple iPhone 4s with 8GB of memory (not connected) & waterproof Life proof case
- 1 Goal Zero solar charger with Sherpa battery backup
- Satellite texting system
- 1 iPad 2 with 16GB of memory
- 1 GoPro 3 camera with mount on backpack
- 2 sets of headphones

Applications

Everyday Applications	Outdoor Applications
Notes	Colorado Trail Application
Safari	iTrack Lite
Runtastic	Military Mountaineering
Calculator	SAS Survival
Settings	Take Ten
Calendar	All Trails
Photos	Backpackr
Facetime	GPS Trails LE
Videos	Forecast
iBooks	SC Guide
App Store	iSurvive
Contacts	GPS Hiker
Reminders	WhatKnot
Clock	MapMyHike
Compass	Wild Plants
Vine	SurvivalGuide
Follow Me	OHub Mobile
Weather	Earthmate
iTunes Store	Bkpack Tips
Game Center	Campee
Maps	Backpacker
Google Maps	iCPRLite
Instagram	
Messenger	

Yahoo

Facebook

Snapchat

Twitter

Camera

The Weather Channel

Google

Pinterest

Pandora

APPENDIX E
MAP OF MY TRAVEL

MAP OF MY TRAVEL

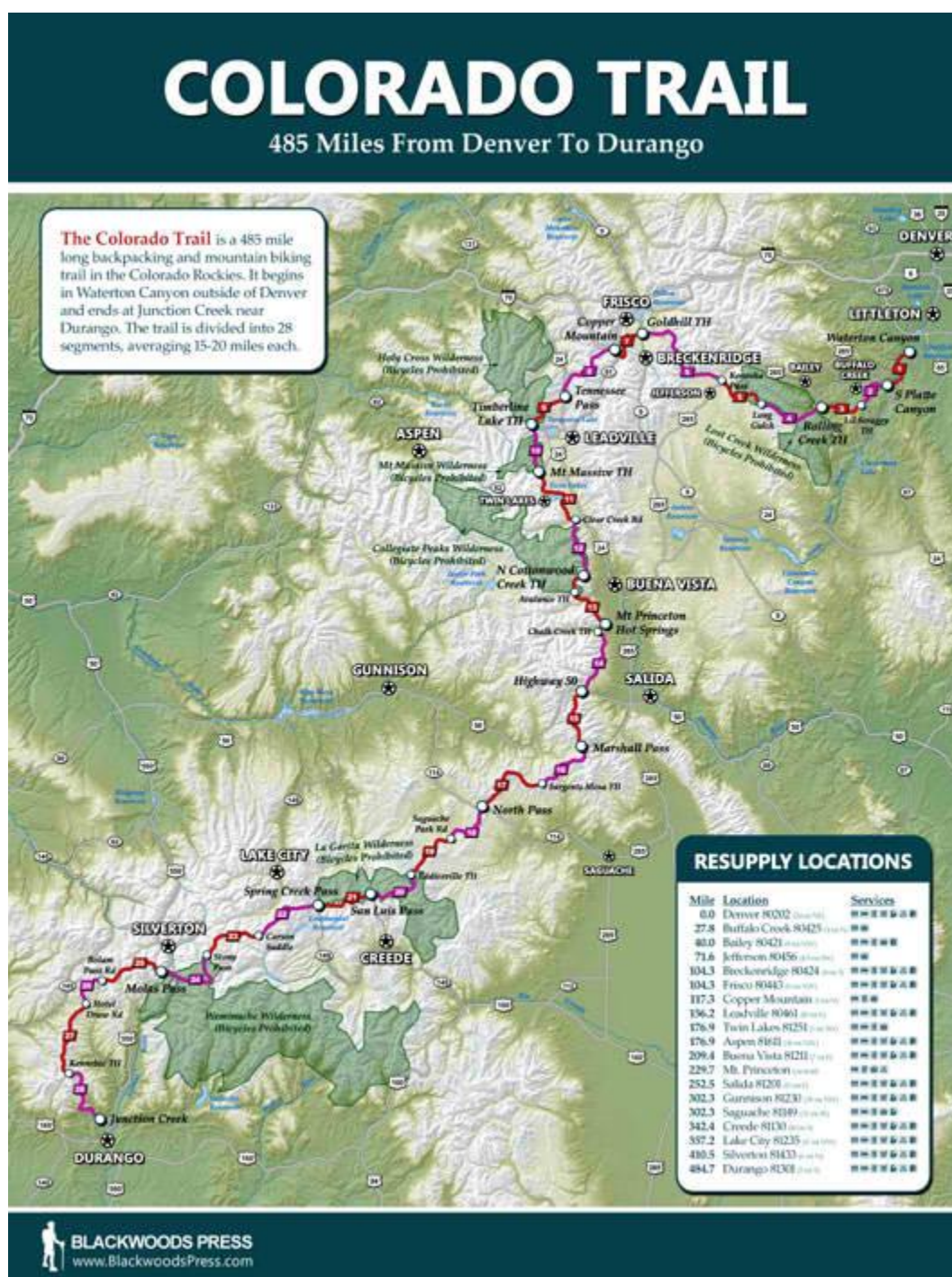


Photo 48. Colorado Trail Wall Map.

APPENDIX F
LITERATURE REVIEW

LITERATURE REVIEW

Industry Background

One of the fastest growing industries is smartphones and smartphone technology, International Data Corporation predicts, “Android-based smartphones will reach 1.54 billion units in 2019 from 1.06 billion units in 2014. Apple's iOS smartphone shipments, on the other hand, will reach 269.6 million in 2019 from 192.7 million in 2014” (Zacks investment research, 2015, para. 8). Within this industry is a segment that in time could outperform manufacturers and service providers, the smartphone application and the programming market. Research firm, Gartner, estimates that 103 billion apps (mobile software applications) were downloaded in 2013 (Dredge, 2013). This same report predicts revenues set to reach \$26 billion even though 91% of the applications are still free of charge. Smartphone applications have a multitude of purposes from gaming and vehicle navigation to teaching (Young, 2011). With such explosive growth in such a short period of time, opportunities exist for Educational Technologists and Instructional Designers to further develop learning applications and programs that take advantage of this ever-changing mobile learning or m-learning environments.

The pace at which educational technology evolves provides ever-changing opportunities to explore new and innovative concepts for expanding knowledge and methods for learning and application of technology education within smartphones and the apps they run. Nayeem Islam, Qualcomm and Roy Want, Google recently published a paper explaining how changes in technology will help propel rapid growth in the smartphone industry, “. . . smartphones will continue to provide us with a pervasive computing platform that is evolving almost as fast as we can invent new applications and

continuing to support our needs for work, entertainment, and education” (Islam, & Want, 2014, p. 92). Today, smartphone technology is out selling personal computers and is one of the fastest growing sectors of the computer industry, “It appears that smartphone sales will far surpass their PC counterparts, with the numbers expected to reach 1.5 billion units in 2016” (Sadewo, 2012). Comparing smartphones to computers may seem strange, but in an ever-changing landscape, smartphones have become computer platform devices, “At the core these devices are platforms that use processors coupled with memory running an operating system in a mobile form” (Quinn, 2011, p. 42). This landscape of smartphone technology and its integration with wireless and Internet technologies have given cause to believe that this technology will be the predominate computer and technology platform in the next five to ten years, “Mobile phones have replaced desktop or laptop computers as the primary means of wireless Internet access for English speaking Hispanics (68%), and African Americans (65%) in the U.S., far outpacing Whites (33%), many whom choose to use laptops” (Horrigan, 2009).

In 2011, there were 5.9 billion mobile phones subscriptions worldwide (International Telecommunication Union, 2011). Not all of these are smart, meaning that they have abilities beyond voice and text communication, for example, data, but as technology advances and economies of scale retreat, the cost of ownership continues to decrease. With subscriptions averaging \$47.68 per month (Bar-Gill & Stone, 2012) pricing can increase substantially depending on coverage, data usage, and other complementary services. Telecommunication companies seem to have a product for most lower middle to upper income individuals and families. For those who cannot afford a

regular subscription or who may not have the credit to establish an account, pay-as-you-go options are available from a multitude of companies.

Today's smartphone software market is highly competitive with the two largest competitors, Apple's iOS and Google's Android operating having the majority of market share (International Telecommunication Union, 2011). These smartphone systems have the ability to distribute educational materials, display images, connect to the Internet, and display websites. This allows interactivity with Internet sourced information and downloads that comply with many popular computer applications, for example, Microsoft Office. Smartphones allow their users to store and use educational guides with instructions. Smartphones have found ways of crossing into several occupational, social, and educational fields due to these compatibilities (Union, 2010).

One divergence from traditional computer capabilities is the appearance of applications available for smartphones, in particular the iPhone, Apple's proprietary hardware and software phone system. Apple's application store offers "apps," specialized programs that generally serve limited functions, for example, games, calculators, music storage, e-book storage, GPS programs, and many other proprietary software applications for productivity and entertainment. Since 2007, over 3 billion apps have been downloaded via the Apple store (Wong & Tan, 2012). Generally, these apps are less expensive and emergent than traditional computer software programs, with several applications offering a "lite" or trial version, so iPhone users can decide if the app meets their needs and whether or not to purchase the full version. In many cases full versions cost between \$.99 and \$19.99. The apps are relatively inexpensive because of the size of

the market and economies of scale, allowing for a large market of competitors to innovate and offer an ever-expanding variety of applications.

Exploring smartphones as a tool one finds other uses that exploit both the hardware and smartphone software applications. When used in combination they again augment the user's experience to increase success when used along with pre-learned skills. Along with location, tools sometimes referred to as GPS, other applications or apps can be used to survive situations. Smartphones feature a variety of apps to improve sequential actions that increase the odds of survival of a victim during cardiac arrest. Cardiopulmonary resuscitation (CPR) considered as the first action during cardiac arrest can enhance, double, or triple the chance of victim survival. Studies have shown that medical professionals often do not meet the guidelines for offering quality CPR (Kovic & Lulic, 2011), but there are applications that have shown improvement when used in conjunction with trained CPR providers.

In the App Store, there are a large number of active applications. According to Apple's App store has topped 25 billion downloads as of March 5, 2012, the latest report describes approximately 250,000 active applications. The first three categories are: books 43,809 applications (17.32%); games 36,719 applications (14.52%); entertainment 28,771 applications (11.38%). The medical category is the 17th with 3820 applications (1.51%). In the U.S. App Store using the iTunes search engine with the term "CPR" there are 77 applications. iCPR is the seventh application among CPR applications with an assessment rating of 3.5 out of 5 (average of 310 ratings; Semeraro et al., 2011).

iCPR is an application that assists medical service providers giving them consistent and improved medical treatment when providing CPR. The app does this by

monitoring the depth of compressions while helping with the timing of compressions allowing for a more consistent CPR session that improves outcomes. Semeraro et al., (2011) reported that the use of iCPR an iPhone app dedicated to self-directed CPR, did improve the quality of the chest compression rate during a simulated CPR scenario.

With much of today's current research focusing on medical and location apps, there are several of the apps that have yet to be formally studied. Much of what is currently available via application download sites is still widely undiscovered and un-researched as to these apps practicality and usefulness. According to PEW Research Center's Internet and Life Project, Americans spent more time on apps than the desktop or mobile Web-an average of 81 minutes a day with apps compared to 74 minutes a day on the Web (Choney 2011; Schuster, 2012). With the number of apps being developed at an explosive rate understanding the pedagogical principles involved especially in regards to augmented reality are paramount (Rushby, 2012). Having instant data informing the user of what to do if your car breaks down, what to do if you find yourself stranded in the wilderness, or how to apply first aid, may allow the user a greater chance of survival in outdoor education settings. Other apps are more direct in lending assistance, for example, most smartphones now have a flashlight app that turns the phone's camera flash into a flashlight, offering different levels of brightness. Weather applications can help augment an outdoor education lesson and prevent weather related emergencies by informing users before they venture out. Location apps now assist parents to locate their children carrying smartphones, but also allow users to explore more confidently due to the fact that the apps and integration with smartphone software and networking is far improved. New applications of apps are further assisting during critical situations. Facebook and other

social and blogging websites allow for public sourcing of information, allowing groups to provide assistance even though they may be geographically separated or of no relation to the user needing assistance. With all of these new and ever developing apps and varying uses of applications, there is little known of the patterns of use and usefulness of this technology. Nick Rushby (2012), Editor for British Journal of Educational Technology, stated that with all applications of technology, we need research findings that offer proof of educational , economic, and social outcomes and impacts (short term, long term, and systemic) or show how and why such applications fall short of expectations or fail to gain traction.

In 2007, there were 10.6 million traffic accidents, which caused more than 43,100 deaths. Most of these accidents were from teenagers between the ages of 16 and 19 (Query WIS, n.d.). Many of these deaths and secondary accidents could be avoided if the time between the accident and when first responders arrive could be reduced (Champion et al., 2004). Recognizing that there are several different types of first responders EMS World, an advocate for EMS providers, states those eight minutes is the average for firefighter medical first responders precluding the initial four-minute initial response, (Ludwig, 2004). Many more expensive vehicles, for example, BMW, have vehicle sensing systems that alert emergency response services at the time of an accident, but most vehicle brands only offer this service as an option, if at all (White, Thompson, Turner, Dougherty, & Schmidt, 2011). Today, smartphones have the ability to address this lack of identification and notification withheld from the typical vehicle. Android and iPhone systems can detect and send a report when an accident occurs, reducing the time for emergency response, “The proposed accident detection algorithm receives inputs

from the vehicle, via ODB-II, and from the smartphone sensors, namely the accelerometer, the magnetometer and the gyroscope.”, (Fernandes, Alam, Gomes, Ferreira, & Oliveira, 2016). Moreover, the most popular single brand among teenagers, iPhone, is also the largest group affected by car accidents (Lenhart, 2009). In addition to the low cost of smartphone detection and notification, smartphones have the capability to provide rich data such as photos, video, and better location information. For this reason insurance companies have entered the market offering apps to help document a car accident and what occurred, “. . . mobile technology can support customers in the aftermath of car accidents to quickly submit a structured loss report and to benefit from faster access to assistance services” (Baecker, Ackermann, Ackermann, & Fleisch, 2010, p. 14). Limitations to these mobile detection apps do exist. For example: If the smartphone relays impact data, a dropped phone in the vehicle could signal a false accident and make it hard to distinguish between a true accident (Kovic & Lulic, 2011; White et al., 2011).

Asynchronous Learning

Asynchronous learning takes place where and when the learner or participant wishes it to be, “. . . classes are conducted "asynchronously," that is, there is no need for students and faculty to assemble at the same time, as in traditional classroom” (Mayadas, Bourne, & Bacsich, 2009, p. 86). In most online education environments, there are usually time limits given and terms must end, and grades must be processed, but in most informal learning environments, no time limit is required. So for the most part, much of what we learn today through mobile technology is considered asynchronous, such as when I play a YouTube video for a guitar lesson, I am usually doing it when I have the

time and the recorded instructor can offer me the lesson over and over again on my schedule. In a mobile environment, there are two forms of asynchronous learning, static and fluid. The static form of asynchronous learning is one where all information is concrete and unchangeable, for example, a PDF file. This type of information may not conform to a given situation exactly, but it does allow for access to information when connectivity is not possible, for example, loss of phone and/or data coverage. Fluid or dynamic information allows for changes to requests and uploads of new information as the situation dictates. For example: A group of mountain climbers may want to know what the current weather patterns are as they ascend a mountain. At different stages in their climb they would access a connected weather application to help them augment their decision to continue or descend. One limitation to fluid information is that it can take time to access the right portal of information and, in cases where the information is time sensitive, a backup of static information may be useful.

Synchronous Learning

In its traditional form, synchronous learning is live classroom or lecture type learning, happening in real time. (Seel, 2012, p. 3256). Today, this learning can take place in different forms with connected classrooms that allow students to sit in a lecture together even though they are often a world apart. One form of synchronous learning is that of public sourcing or cooperative learning, where information is solicited from a group of members that subscribe to a web source and questions, issues or situations are posed in order to gain information from the sources' participants, usually subject matter experts. These experts may be needed for technological aspects of the study, outdoor educational aspects of the study, and/or procedural process for data collection and

reporting of data. For this study, three types of synchronous mobile applications were tested, Twitter, Facebook messaging, and some form of live video webcasting that allows for immediate feedback from viewers. These three communication forums may be used separately, or in conjunction with one another to develop a synchronous learning platform. Because of the distance to communication networks, for example, cellular phone towers, most of the synchronous connectivity took place while located within certain distances of urban centers. This study provides data linking successful synchronous learning with connectivity in relation to proximity to populous areas.

For synchronous learning to occur, the participant must have real-time feedback. This feedback can be in many different forms, for example, navigation in the form of a mapping application. Some of these applications rely on hardware that is already built into the hardware interface, for example, smartphone, such as a gyroscope, leveling, and compass hardware that produces information based upon the participant's physical environment. This coordination of software and hardware attributes work in conjunction to augment the learning environment, and assist the participant in making informed decisions about different situations in an outdoor environment.

Public Sourcing

Public sourcing takes the elements of social networking and formats them in a way where relationships are based upon a common interest and peer connections or followers communicate in order to collaborate to reach a common objective, which may include an end result or continued growth of information. The big difference between social networking and public sourcing is that there may be no connection to peers or followers other than the common interest. That said, social networking connections could

also be public sourcing connections or followers. In a recent editorial in *British Journal of Educational Technology* the authors expressed the great need for further research of these phenomenon and stated that the analysis of social-technical mechanisms that support the content and context generation process requires a better understanding of the affordances and potential of social and mobile technologies (Pachler, Ranieri, Manca, & Cook, 2012).

Augmented Learning

When a tool is used to assist in the learning process, the assistance is considered augmented learning. Much of what is written about augmentation is related to gaming and falls under the category of augmented reality, but for the purpose of this study, we will stay with Clark Quinn's description of assisting in the learning process. Even though Eric Klopfer (2008) talks about gaming, much of what he describes as augmented learning can be used to describe the use of a smartphone and its applications in the same way. He explains that specific applications with location awareness can help to blend the real world with the virtual world to produce augmented learning. That with portability and ubiquity of these universal machines allows the learner to move around in different landscapes. In the previous description of smartphones as gaming consoles, Klopfer (2008) indirectly describes how other applications interface with the user, for example, Google Maps. The idea that the landscape can be manipulated for the user depending on the information sought or the current GPS positioning of the smartphone, augments the user's ability to gain the information needed for the educational outcome. Overall, for the purposes of this study the use of a smartphone as a learning tool and its ability to augment or assist in the learning process was participant centered. In addition, some augmentation took place through public sourcing, with subject matter experts (SMEs)

relaying information or feedback via a social networking site, for example, Facebook.

This form of collaboration has been shown to be successful in past studies, McLoughlin and Lee (2007) “. . . students through the use of MW 2.0 tools were able to remix and remodel the concepts through collaboration with others and apply it to improve their own learning” (Davis, Gee, & Narayan, 2012).

Mobile Learning

Mobile learning or m-learning has gained attention as smart technology; broadband access, and software innovations have perpetually progressed. New information and access to this information has increased as m-learning users have adapted current technology to expand its use on different platforms and interfaces. Alexa Internet current rankings as of December 7, 2013, put YouTube as the third most visited website behind Google, and Facebook, where it has become a common place for training videos on any number of subjects. As participants view more training information, they begin to use adaptive learning to interpret and process information more accurately and more quickly. This same adaptive quality proved prevalent in my m-learning as it related to outdoor education situations, for example, how to use bear spray, how to pack a backpack, and how to use the Jetboil cooking system. In addition, I was able to pick up tips to adapt hardware for uses beyond their intended purpose, for example, cook pots used for storage.

Social Networking

Applications are but one learning function propagated by smartphones another form on educational assistance or tool of augmentation includes public sourcing. To understand public sourcing it is important to understand social networking “. . . learners

and teachers, as well as workers, especially in developed countries, are more and more involved in complex webs of relationships and networks with others exchanging information and sharing knowledge” (Pachler et al., 2012). For the purposes of this study social networking uses Web based forums such as Facebook and Twitter as well as others to develop friend and peer social relationship connections usually among friends, peers, and to a lesser extent co-workers. Public sourcing works through peers providing information when a question is raised or if a topic is at hand.

Learning Using Smartphones

Learning using a smartphone as a tool in an outdoor setting will vary depending on how a participant will act in a particular way regarding the information, and how it is deciphered and then used towards a learning outcome. Shin et al. explains that while smartphones have not yet become ubiquitous they will soon become essential in learning, “It is important to investigate how users perceive usability, how their continuance intentions are formed and what cognitive perceptions are fulfilled in order to determine possible uses of smartphones in higher education” (Shin, Shin, Choo, & Beom, 2011, p. 2207).

During this study, the iPhone and apps were used to augment learning, becoming the participant’s mentor. While not a person, the technology took on the role of teacher and mentor augmenting the learning experience much like Vygotsky’s theory, Zone of Proximal Development (ZPD). Vygotsky’s (1978) ZPD exist when a teacher or peer(s) assist in learning with skills greater than the student, "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers ” (p. 86).

Vygotsky never used scaffolding as a definition to ZPD, but much like a scaffolded experience, Vygotsky believed that once a student had received the assistance needed to complete a task, the assistance could be removed and that the student could successfully complete the task on their own. Scaffolding was defined by Wood et al. (1976) as “Those elements of the task that are initially beyond the learner’s capacity, thus permitting him to concentrate upon and complete only those elements that are within his range of competence” (Wood et al. 1976, p. 90). For my study, Vygotsky’s ZPD and Vygotsky Scaffolding are used interchangeably.

For the purpose of this study, experiential learning will primarily be used to explain learning at an individual task, situation, or event level. Vygotsky’s scaffolding will explain how learning took place over the course of the study. As the participant gains experience with each learning situation using the iPhone and apps as a mentor and guide, the participant should transfer experiential learning to knowledge that builds upon itself, therefore creating scaffolding.

Today, smartphone apps have the ability to give a user location information, areas of interest within this location, locate any peers or friends that are within the given parameters of this location, give users historical and geographical information within the parameters selected, and show accidents to avoid using acoustical data and notify emergency response services in such cases (White et al., 2011). The following is an example of how smartphone technology and applications could augment a user’s experiences and could serve as a tool in survival situations.

The idea of looking at learning using a smartphone as a tool in an outdoor setting meant that the participant had to act in a particular way regarding the information and

how it was deciphered and then used towards a learning outcome. What became less important, but still had to be monitored was the epistemological model in which a particular experience fit; and for this study, the “best fit” will be the one that best defines that there was a learned outcome. Peter Boghossian’s (2006) *Behaviorism, Constructivism, and Socratic Pedagogy* described how three forms of pedagogy could exist simultaneously even though researchers often times presented these theories “as either-or propositions, false dichotomies that educators must choose between” (p. 714). To this end, three dominant theories (Behaviorism, Cognitivist, and Constructionism) were chosen to help identify learning and define what may have occurred when a smartphone augments a learning situation and knowledge became the outcome. In many cases, researchers that subscribed to a multi-theory approach might have blended the approaches, “Rather than perpetuate the needless dichotomies that characterize the discourse emanating from both rigid behaviorism and naïve humanism, we propose a synthesis” (Cohen & Hersh, 1972, p. 172). For the purpose of this study, the three theories were treated as separate and not overlapping. They were chosen based upon the situational basis for measuring that learning outcomes “If a learning environment provides students the opportunity to move fluidly along the behaviorist-cognitivist-constructivist continuum, the focus of instruction shifts from teaching to learning, from a transfer of facts and routines to the active application of ideas to problems” (Ether & Newby, 1993, p. 130).

The characteristics that made behaviorism a good fit for one of three learning theories were the basic elements that made it easy to measure as a learning outcome given an outdoor educational situation, “The concepts of stimulus, response, and

reinforcement have proved to be very useful in the analysis and study of learning” (Blyth, 1962, p. 52). For this study, it was perceived that behaviorism was chosen as the learning theory of choice, because a learning situation or stimuli presented itself, the participant responded, and there was a positive or negative outcome to the response, causing reinforcement. This learning experience might not have been evident when first experienced, but might need retrospective or future similar incidents to realize reinforcement. An example of behaviorist learning would have been applications most likely static with “instructional drill-and-practice software programs . . . sequential instructional programs where mastery of one lesson was a prerequisite to going on to the next lesson” (Chang, 2008, p. 67). These again would have been behaviorist types of applications on a mobile learning platform, but that was not to say that other types of applications could have led to a behaviorist learning outcome, citing a situation where there is a stimulus--response due to augmented learning from a mobile platform then a positive or negative learning outcome.

The second of the three theories used to gauge learning in this study was Cognitivist. It was chosen for its characteristics which revolved around how memory worked and knowledge was recorded and recovered, “Cognitivist designers have given us only a few programs, but many of those programs emphasize memory ‘tricks’ and deal with learning through expanded experience accompanied by small chunks of instruction” (Cates, 1993, p. 134. Using cognitivist theory to explain how prior experiences were pulled from memory allowed for expanded dialog of how information is augmented using m-learning as well as adapted for purposes beyond memory’s intentions. The second research question dealt with the translation of information, there was a rationality for

decision making and learning was more based upon prior knowledge and experience, “. . . the cognitivist model can be considered a general model, of which the ‘rational-choice-model’ is a particular case” (Boudon, 1996, p. 146).

The final of three learning theories, Constructivism, was chosen due to the discipline of discovery learning. For the most part pure discovery learning is solely based upon the student and very little if any direction is provided by the teacher or instructor. In outdoor learning situations where an instructor is present the learning may be modeled by the instructor indirectly prompting student questions, “. . . rather than the teacher showing and telling the students how to move, the teacher uses a series of questions to prompt student engagement in both cognitive and psychomotor domains” (Glyn, 2007). Metzler et al. (2000) further explains that teachers may ask questions that prompt the students to think, which then leads to an answer in the form of some type of movement. For this study, the primary instruction will come from the smartphone and applications as well as public sourced information. The discovery aspect of the study has to do with the participant/researcher and the research questions as the guiding principle for discovery and the realization of learning outcomes. The important factor to consider is that discovery learning can be crafted in different ways depending on the environment and role of the teacher in the construction of the learning situation, “the learner is encouraged to employ a variety of different strategies, some more appropriate than others, until he or she finally discovers the best coordination pattern” (Rose & Christine, 2006).

When a tool is used to assist in the learning process this assistance is considered augmented learning. Much of what is written about augmentation is related to gaming and falls under the category of augmented reality, but for the purpose of this study, we

will stay with Clark Quinn's description of assisting in the learning process. Even though Eric Klopfer (2008) talks about gaming much of what he describes as augmented learning can be used to describe the use of a smartphone and its applications in the same way, "... location awareness, allowing for the development of place-specific applications that blend the "real world" with the "game world" to produce the augmented learning ... portability and ubiquity, which means that they can be universal machines, moving around to different landscapes" (Klopfer, 2008). In the previous description of smartphones as gaming consoles Klopfer indirectly describes how other applications interface with the user, e.g., Google Maps. The idea that the landscape can be manipulated for the user depending on the information sought or the current GPS positioning of the smartphone augments the user's ability to gain the information needed for the educational outcome. Overall, for the purposes of this study the use of a smartphone as a learning tool and its ability to augment or assist in the learning process will most likely be participant centered. In addition, augmentation will take place through public sourcing, with subject matter experts (SMEs) relaying information or feedback via a social networking site, e.g. Facebook. This form of collaboration has been shown to be successful in past studies, McLoughlin and Lee (2007) "... students through the use of MW 2.0 tools were able to remix and remodel the concepts through collaboration with others and apply it to improve their own learning" (Davis et al., 2012, p. 13).

Mobile learning or m-learning has gained attention as smart technology, broadband access, and software innovations have perpetually progressed. New information and access to this information has increased as m-learning users have adapted current technology to expand its use on different platforms and interfaces. Alexa

Internet current rankings as of December 7, 2013, put YouTube as the third most visited website behind Google, and Facebook, where it has become a common place for training videos for any number of subjects. As participants, view more training information they begin to use adaptive learning to interpret and process information more accurately and more quickly. This same adaptive quality should prove prevalent in m-learning as it relates to outdoor education situations.

John Dewey's views on education fit well with how outdoor education outcomes may have originated and how experience might have been significant in regards to experience, "Dewey (1938) suggested that learning occurs as a result of problem solving in authentic environments faced by the learner, where education is the changing of behaviors through experience" (Martin & Fleming, 2010, p. 41).

In 2011, there were 5.9 billion mobile phones subscriptions worldwide (International Telecommunication Union, 2011). Not all of these are smart, meaning that they have abilities beyond voice and text communication, e.g., data, but as technology advances and economies of scale retreat the cost of ownership continues to decrease. With subscriptions averaging \$47.68 per month, (Bar-Gill & Stone, 2012) pricing can increase substantially depending on coverage, data usage, and other complementary services. Telecommunication companies seem to have a product for most lower middle to upper income individuals and families. For those who cannot afford a regular subscription or who may not have the credit to establish an account, pay-as-you-go options are available from a multitude of companies.

Today's smartphone software market is highly competitive with the two largest competitors, Apple's iOS and Google's Android operating having the majority of market

share (International Telecommunication Union, 2011). These smartphone systems have the ability to distribute educational materials, display images, connect to the Internet, and display websites. This allows interactivity with Internet sourced information and downloads that comply with many popular computer applications, e.g., Microsoft Office. Smartphones allow their users to store and use educational guides with instructions. Smartphones have found ways of crossing into several occupational, social, and educational fields due to these compatibilities (Union, 2010).

One divergence from traditional computer capabilities is the appearance of applications available for smartphones, in particular the iPhone, Apple's proprietary hardware and software phone system. Apple's application store offers "apps," specialized programs that generally serve limited functions, e.g., game, calculator, music storage, e-book storage, GPS program, or many other proprietary software applications for productivity and entertainment. Since 2007, over 3 billion apps have been downloaded via the Apple store (Wong & Tan, 2012). Generally, these apps are less expensive and emergent than traditional computer software programs, with several applications offering a "lite" or trial version, so iPhone users can decide if the app meets their needs and whether or not to purchase the full version. In many cases full versions cost between \$.99 and \$19.99. The apps are relatively inexpensive because of the size of the market and economies of scale, allowing for a large market of competitors to innovate and offer an ever-expanding variety of applications.

Today, smartphone apps have the ability to give a user location information, areas of interest within this location, locate any peers or friends that are within the given parameters of this location, give users historical and geographical information within the

parameters selected, and show accidents to avoid using acoustical data and notify emergency response services in such cases (White et al., 2011). The following is an example of how smartphone technology augments user's experiences and can serve as a tool in survival situations:

In 2007, there were 10.6 million traffic accidents, which caused more than 43,100 deaths. Most of these accidents were from teenagers between the ages of 16 and 19 (Query WIS, n.d.). Many of these deaths and secondary accidents could be avoided if the time between the accident and when first responders arrive could be reduced (Champion et al., 2004). Many more expensive vehicles, e.g. BMW, have vehicle sensing systems that alert emergency response services at the time of an accident, but most vehicle brands only offer this service as an option, if at all (White et al., 2011). Today, smartphones have the ability to address this lack of identification and notification withheld from the typical vehicle. Android and iPhone systems can detect and send a report when an accident occurs, reducing the time for emergency response. Moreover, the most popular single brand among teenagers, iPhone, is also the largest group affected by car accidents (Lenhart, 2009). In addition to the low cost of smartphone detection and notification, smartphones have the capability to provide rich data such as photos, video, and better location information. For this reason, insurance companies have entered the market offering apps to help document a car accident and what occurred. Limitations to these mobile detection apps do exist. For example: If the smartphone relays impact data, a dropped phone in the vehicle could signal a false accident and make it hard to distinguish between a true accident (Kovic & Lulic, 2011; White et al., 2011).

With exception to smartphone GPS and applications of app programs in medical settings, most of these smartphone technologies are still under or un-researched. The pilot studies in the appendix provides information to begin an understanding for further examination in both qualitative and quantitative research and develop thoughts on the usefulness and practicality of smartphone applications and their use in critical, emergency, or survival situations.

Exploring smartphones as a tool shows that there are other uses that exploit both hardware and smartphone software applications. When used in combination they again augment the user's experience to increase success when used along with pre-learned skills. Along with location tools sometimes referred to as GPS, other applications can be used in survival situations. Smartphones feature a variety of apps to improve sequential actions that increase the odds of survival of a victim during cardiac arrest.

Cardiopulmonary resuscitation (CPR) considered as the first action during cardiac arrest can enhance, double, or triple the chance of victim survival. Studies have shown that medical professionals often do not meet the guidelines for offering quality CPR (Kovic & Lulic, 2011), but there are applications that have shown improvement when used in conjunction with trained CPR providers.

In the App Store, there are a large number of active applications. According to Apple's App store has topped 25 billion downloads as of March 5, 2012, the latest report describes approximately 250,000 active applications. The first three categories were: books 43,809 applications (17.32%), games 36,719 applications (14.52%), and entertainment 28,771 applications (11.38%). The medical category is the seventeenth with 3820 applications (1.51%). In the U.S. App Store using the iTunes search engine

with the term “CPR” there are 77 applications. The iCPR is the seventh application among CPR applications with an assessment rating of 3.5 out of 5 (average of 310 ratings; Semeraro et al., 2011).

The iCPR was an application that assisted medical service providers giving them consistent and improved medical treatment when providing CPR. The app did this by monitoring the depth of compressions while helping with the timing of compressions allowing for a more consistent CPR session that improves outcomes. Semeraro et al. (2011) reported that the use of iCPR, an iPhone app dedicated to self-directed CPR, did improve the quality of the chest compression rate during a simulated CPR scenario.

With much of today’s current research focusing on medical and location apps, there are several of the apps that have yet to be formally studied. Much of what is currently available via application download sites is still widely undiscovered and un-researched as to these apps practicality and usefulness. According to *PEW Research Center’s Internet and Life Project*, Americans spent more time on apps than the desktop or mobile Web—an average of 81 minutes a day with apps compared to 74 minutes a day on the Web (Choney 2011; Schuster, 2012). With the number of apps being developed at an explosive rate, understanding the pedagogical principles involved especially in regards to augmented reality are paramount (Rushby, 2012). Having instant data informing the user of what to do if your car breaks down, what to do if you find yourself stranded in the wilderness, or how to apply first aid, may allow the user a greater chance of survival in outdoor education settings. Other apps are more direct in lending assistance, for example, most smartphones now have a flashlight app that turns the phone’s camera flash into a flashlight, offering different levels of brightness. Weather applications can help augment

an outdoor education lesson and prevent weather related emergencies by informing users before they venture out. Location apps now assist parents to locate their smartphone carrying children, and allow users to explore more confidently due to the fact that the apps and integration with smartphone software and networking is far improved. New applications of apps are further assisting during critical situations. Facebook and other social and blogging websites allow for public sourcing of information, allowing groups to provide assistance even though they may be geographically separated or of no relation to the user needing assistance. With all of these new and ever developing apps and varying uses of applications, there is little known of the patterns of use and usefulness of this technology. Nick Rushby (2012), Editor for *British Journal of Educational Technology* stated that with all applications of technology, we need research findings that offer proof of educational , economic, and social outcomes and impacts (short term, long term, and systemic) or show how and why such applications fall short of expectations or fail to gain traction.

Applications are but one learning function propagated by smartphones another form on educational assistance or tool of augmentation includes public sourcing. To understand public sourcing it is important to understand social networking “. . . learners and teachers, as well as workers, especially in developed countries, are more and more involved in complex webs of relationships and networks with others exchanging information and sharing knowledge” (Pachler et al., 2012). For the purposes of this study social networking uses Web based forums such as Facebook and Twitter as well as others to develop friend and peer social relationship connections usually among friends, peers,

and to a lesser extent co-workers. Public sourcing works through peers providing information when a question is raised or if a topic is at hand.

Public sourcing takes the elements of social networking and formats them in a way where relationships are based upon a common interest and peer connections or followers communicate in order to collaborate to reach a common objective, which may include an end result or continued growth of information. The big difference between social networking and public sourcing is that there may be no connection to peers or followers other than the common interest. That said, social networking connections could also be public sourcing connections or followers. In a recent editorial in the *British Journal of Educational Technology* the authors expressed the great need for further research of these phenomenon and stated that the analysis of social-technical mechanisms that support the content and context generation process requires a better understanding of the affordances and potential of social and mobile technologies (Pachler et al., 2012).

Linking pedagogy and public sourcing as a function or augmentation to formal learning, one must first understand that this process requires that a Master/Apprentice relationship be established for the information to be credible. In a recent article published by the *British Journal of Educational Technology*, Pimmer et al. (2012) explain how this transformation of information is now taking place in developing countries “. . . the main direction of techno-centric and transmissional approaches appears to be from developed to “developing” countries respectively from experts to novices” (p.726). Concerning learning theory, this approach could boarder cognitivist theory where the expert is pulling information from his or her memory banks and informing the learner of what they know for the learner to then use the information and re-store it for future use. This is a bit of a

stretch in situations where the learner is truly a novice and may need the information or instruction to immediately respond to a situation in an outdoor environment. More likely this approach would fit with constructivist theory where the participant gains immediate knowledge that allows him or her to be assisted or augmented with the procedures needed to have a learning outcome, “learning is considered as situated meaning-making and identity formation” (Pachler, Bachmair, et al., 2010; Pachler, Cook, etc. 2010).

Up to this point, the focus has been on the software components of m-learning in an outdoor education setting. Because of logistics, another consideration that plays an equally important role is the actual hardware required to access, perform, and illustrate the information, communication, and actual tools, e.g. flashlight, available through a smartphone. More importantly are outside technologies that assist with the smartphone sometimes referred to as wearable technology.

One area of wearable technology is power production. Conceptually, solar panels sewn onto clothing or a backpack in order to allow hardware to charge while running applications that produce information in an active environment could be considered wearable technology. Unfortunately, current peer reviewed research with these types of literal applications are very limited with most of the current formal research focused on wearable technologies in the field of biomedical applications. For the purpose of this study, the limited formal research in wearable technologies is primarily sourced through the information available from the current uses in the biomedical field. Additionally, how these technologies might cross over into the field of education. Furthermore, certain questions surface concerning ethical practices of how wearable technology information

could be used and how breaches in privacy of such information could cause concern for the individual user.

For the most part wearable technology is not new concept, as the *2013 Horizon Report* explained, early forms of such technology appeared in the 1970s in the form of calculator watches. What has changed are the uses of complementary and/ or converging technology that can accompany these innovations. From cameras built into clothing that upload pictures to social media sites to decorative solar panels built into shirts that charge batteries and power mobile smart technology. There is also a convergence of high tech materials and technology where fibers can be interwoven into clothing that allows for functionality way beyond warmth and moisture wicking properties.

Heart rate monitors help athletes as well as average people train for a multitude of activities that require increases or decreases in vitals. The technology generally consists of a chest strap and wristwatch that is calibrated based upon weight, gender, and height. From that point, the watch would collect information such as pulse rate and convert that information into calories burned, maximum and minimum heart rate, time of exertion, and calories burned. Downloading this information helps to establish baselines of information and assist in a nutritional planning as well as a complementary programming to prepare for these endurance activities. Today this same technology is coupled with GPS and social media information that allows status updates and even allows athletes the ability to follow other participant's progress through a competitive interface, which is free on the Internet.

New innovations in helmet design have allowed athletes to use audio devices built into their snowboard and bicycle helmets to communicate with other participants, track

progress, and give feedback on performance. Someday this same technology could soon be implemented in sports where blunt force trauma is prevalent allowing researchers better insight into how to protect these athletes.

Distributed Inferencing with Ambient and Wearable Sensors (Atallah et al., 2011) describe the current status of miniaturized sensors interwoven into clothing and the ability to collect and analyze data and monitor activities using both wearable and ambient sensors. Wearable sensors capture movement, while ambient sensors “infer the context of those movements.” The applications vary from monitoring of the environment to that of checking physiological parameters such as heart rate. Additionally, this form of wearable sensor networking research is allowing for new innovations in adaptable interactive environments such as smart homes that change depending on changes of the user’s needs. Some of the current drawbacks to this technology include: sensor range, limited stored energy, changes in geographical environment, and multi subject identification. An example of how this technology might work in a home environment would include sensors that can tell whether or not you are inside a particular room; usage sensors detecting television, phone or appliance usage, door usage sensors and sensors for activity and posture. Computer mapping is then used to establish routines. The authors believe that future research in this field will be beneficial for behavior profiling and ergonomic design.

With headbands that can monitor brain activity through the use of sensor technology, it is not so farfetched to imagine educational monitoring systems that record such activity and give feedback on the success or failure of differing instructional method. This type of feedback would allow instructors to individualize lessons for the

best fit of a particular student. Applications that may be closer to reality include devices such as Google's "Project Glass" which uses visual information and augmented reality to give the user information about his or her surroundings. Adapting this technology to an outdoor educational setting could allow participants a new dimension of gathering and deciphering information. For example: A day hike through a historical mining site would now be complemented with personalized information augmented through Google Glasses allowing for a unique experience for each hiker based upon predetermined interests.

Smart Wearable Systems: Current Status and Future Challenges (Chan et al., 2011) explains how smart wearable system (SWS) are impacting the areas of academia and industry especially medical research with a primary focus on care for the elderly, but also including infant respiratory situations, and military battlefield situations. These SWS come in an array of wearable and implantable devices, capable of monitoring vital signs such as: temperature, heart rate, blood pressure, oxygen levels, electrocardiograms, and respiration rates. These types of SWS allow physicians to monitor patients in real-time during their normal life activities. Smart Wearable Systems currently have the capability to measure physiological, biochemical, and motion sensing. Concerns include: user needs, user acceptance, privacy, ethics, legality, effectiveness, cost, psychological and social issues, hardware and software, implantation site, and unconstructiveness. This technology has opened new avenues for pharmaceutical companies who now have an opportunity to become more accurate, and converge different treatments catered to the individual becoming more efficient and effective. The authors believe for this technology to make the next big leap more integration into fields other than the medical field will be required. Finally, the most important challenges that must still be addressed are: smart

signal processing, data analysis and interpretation, communication standards, component efficiency, and energy supply.

Medical research, education, innovations, and practice will be forever changed with wearable technology that continually monitors all aspects of an individual's physiology. Such technology will deliver information to a doctor who then makes micro adjustments to the wearable item delivering any needed supplements, medication, or alerts an individual to come in for consult. This same technology will allow parents and schools to monitor individual nutritional intake of students and make adjustments to menus and habits to maximize functionality at the cellular level so that every student will have a nutritional advantage for school performance. Extended further this type of information could be extremely valuable for individuals participating in outdoor events that require high levels of nutritional intake to remain safe and efficient.

An Overview of Smart Technologies for Clothing Design and Engineering (Tang & Stylios, 2005), the authors describe a convergence between clothing design, engineering, and science in the development of smart clothing. Expertise in the aerospace, civil engineering, automotive, and medical industries coupled with advances in performance and fashion wear are helping to create new smart technologies in clothing. The idea of smart clothing includes materials that respond, control, or act in a predicted manner to the environment, reacting mechanically, thermally, chemically, magnetically, or in other forms (Tao, 2001). The U.S. military is a major player in smart clothing commissioning research for body armor, artificial muscles, physiological monitoring, and wearable electronics for communication. Adidas is one of the leaders in commercialized wearable technology, creating a shoe with microprocessors and motors

that adjust cushioning. Conductive materials that carry electrical conductivity allow for the transfer of electronic information and energy as supplies for other embedded technology. Growth in this market segment is expected to go in different, but consistently converging ways including: performance driven smart clothing, continuous monitoring smart clothing for rehabilitation, military use, and fashion design smart clothing with an emphasis on effective appeal. Some of the foreseen issues include: weight, durability, cleaning, and cost. The integration of current technologies will also help speed the time in which wearable technologies arrive to market. Adapting sensors, conductive materials, solar power and electronics will aid in the speed of innovation.

Psychomotor skills could be enhanced by wearing self-correcting materials that not only provide greater sensation, but also enhance or restrict movement based upon instructional protocol for a particular lesson. An example for this might be architectural or engineering design where an incorrect element is drawn and a wearable glove corrects the mistake while an interface instructs the student why the element was incorrect and why a change should be made. Imagine the impact on students with poor handwriting. There are already evolving wearable technologies for people with disabilities. In the very new future, wearable technology would allow students with certain physical disabilities to accomplish tasks never thought possible.

Wearable technology is not new to simulation but as new materials are developed and refined these devices will become more comfortable and maybe even seamless in simulation. Actually, entering a simulation physically and having clothing that constricts into the posture of a chair when one is visually presented, or fabrics with nano technology that can make a user feel as though the individual is on horseback even though it is only

visualization. These wearable technologies will lead to new and more innovative ways to educate students and train workers in a safe environment.

As wearable technology advances questions of ethics began to become apparent. First, some wearable technology is dependent on personal information. Take for example Google's Project Glass, these augmented reality glasses shows information based upon what Google knows about you, where your friends are, eating preferences, entertainment preferences, and your exact location. It would be reasonable to assume that a user of this technology consented to the use of such information, but who might else have access to this private information.

In Jean Clandinin's (2014) *Engaging in Narrative Inquiry*, the author asked two questions that had to be answered before choosing narrative inquiry as a study design, "So what?" and "Who cares?" The first question gets right to the crux of the argument for the design choice. Outdoor education is a unique sub category of education, "The stimulus gained through experiences in the physical aspects of outdoor pursuits and field studies, which are related to character development and innovation in curriculum and examination requirements, is to be encouraged" (Parker & Meldrum, 1974, p. 182). As a well-defined field of study, outdoor education has adequate research but when coupled with mobile learning there are an infinite number of opportunities for study. Mobile learning as an emerging field of education changes rapidly and new innovations are quickly evolving. As the mechanisms of mobile learning in an outdoor environment need to be explored, and the pedagogy legitimized, limitations must also be defined in-order to set technology benchmarks to be further studied and overcome.

Using qualitative narrative to explore the prior themes fits well with Parker and Meldrum definition of outdoor education and the concepts of character development, field studies, and educational outcomes due to innovation in curriculum as it relates to mobile learning and smartphone technology. Narrative inquiry allows for the broad themes of understanding to be documented and the emotions, actions and learning outcomes to be better understood from the participants perspective, “. . . to produce an accurate description of the interpretive narrative accounts individuals or groups use to make sequences of events in their lives or organizations meaningful” (Clandinin & Connelly, 2000). Once themes had been established, the puzzle as Clandinin described it could have been better defined. As more pieces came into focus, more themes developed to be studied both qualitatively and quantitatively.

“Who Cares?” Simple, any individual, organization, or agency that has a need to access outdoor educational information in a mobile environment, “. . . outdoor education programs have a positive impact on the aspects of leadership, academic, personality and interpersonal relationships” (Harun & Salamuddin, 2014, p. 71). Beyond the obvious audience for this research study, it is important to again look at the design and how it will impact further research. Again, outdoor education is reasonably well studied and mobile learning is an ever-evolving innovation in education. What makes the combination of the two unique are the limitations primarily data coverage and the many unknowns as to the application of smartphone applications or apps. In researching the topic and running pilot studies to test the idea of this dissertation certain, “puzzle pieces” have emerged. One is the idea of static versus fluid smartphone applications. As described before, static applications are whole within the memory of the smartphone, e.g., a PDF survival guide.

Fluid applications pull information over a data connection, therefore they are connected.

So who cares? Well the developers for fluid outdoor education applications, phone service providers, and users expecting to gain information from these applications.

Beyond the primary audience, we have the military, the entire world's educational system, and mankind as it relates to gaining educational information from anywhere.

The angle that needs to be understood is why should someone care about this study done as an autobiographical narrative? This is probably the greatest way a study of this kind can be generalized. One individual both participant and researcher, telling a narrative story about a trip from point A to point B, with one type of tool using proprietary applications. It cannot be more subjective, except that there is no interpretation of what the participant perceives, understands, or what any given learned outcome is, because the researcher is actually in the mind of the participant. The angle is that there will be some degree of success and failure with each learning opportunity. The theoretical lens to substantiate data from the storyline of situation, application, and learned outcome helped to define the themes or "puzzle pieces" so that replication on a quantitative or qualitative measure could be taken in future studies. "These attributes, consequences, and values may be 'metafactors' that could be more fully developed using more rigorous quantitative methods to build models, which could be used to test a more robust theory" (Goldenberg, Russell, & Soule, 2011, p. 360).

The implications of researching outdoor education and mobile learning are far reaching. From use in recreational activities, survival situations, or military circumstances it is important to substantiate the usefulness of apps that and their value on mobile device such as an iPhone. For the most part much of what has been studied and

published falls outside of the scope that has been examined in this paper. The themes even though limited to one participant as research provide valuable beginning points for further research and published literature. Apps and the ability to store incredible amounts of information that can be retrieved and used in real time using a mobile device will be of great benefit for those who find a situation or circumstance in which to use this knowledge. Furthermore, understanding that there are limitations with connectivity, and the ability to access information in a fluid state, will help outdoor participants to make informed decisions on how to access information, and to be aware of their reliance on connected information.