Supporting Semesters Abroad Using Technology: 
An Analysis of Distance Learning Considerations

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Abstract:

This paper studies different techniques and methods for delivering instruction to students as they study abroad. The paper also looks at commitment to using e-learning technologies through the lens of information processing and self-determination theory from not only the student’s perspective, but also that of an instructor using the technology. Methods that have been successful in facilitating semesters abroad are shared and supported with relevant literature.
The classroom is an interesting space where ideas are presented, debated, exchanged, taught, and ingrained, as well as a plethora of other activities. Here at the United States Military Academy, it is essential for the development of all involved, Cadets and faculty alike. I have seen the classroom as an opportunity to not only deliver course content to my students, but to also provide an outlet for me to deliver personal and intimate stories that help me relate course concepts to my students. The benefits of the smaller classroom sizes and the ways in which we interact with our students are often lauded worldwide as premier and first-class experiences. However, does this sort of approach suffer when learning becomes distributed across time and space? Advances in technology facilitate the broadening of our Cadets to study all over the world. As our Cadets travel the world for semesters at a time, they lose out on the experiences that we pride ourselves in here at West Point. Complications could arise which may put these students at a disadvantage when they are not afforded ability to physically be present in the classroom. Implications can further reach to proper functioning of attention and memory processes as it applies to their ability to attend to material, process it, and store it for further use in their studies. The purpose of this literature review is to investigate relevant literature in an attempt to determine if delivering instruction to students via distributed learning technologies are effective means to teach in the classroom environment at the United States Military Academy. This review of literature is completed within the scope of the human factors program at West Point.

**Analysis of technological approaches to distributed learning**

The ADDIE Model is a systematical approach to instructional design and its development (Grafinger, 1988). The ADDIE Model (Figure 1) has its roots in military instructional design, and can be used when constructing a course or program. Currently in my program, we are in the evaluation phase after an initial attempt at using distributed learning tools to facilitate the semester abroad experiences of three of our students (two in Mexico, and one in China). The initial analysis, design, development, and implementation yielded overall successful results, but not without technological challenges across the world as we sought to deliver content across time and space and include students in live sessions as much as possible. The use of such tools such as Blackboard Collaborate, Skype, and even simple phone calls made the experience work. Our students were able to view lectures and discuss with their classmates in real-time or through discussions online (email, discussion boards, etc.). Moving forward, a refined and thorough analysis of this type of instructional delivery is necessary in order to meet challenges of a changing curriculum that moves classes to different times of the 47-month developmental experience at West Point. This will be a part of our program’s strategic planning sessions as we iterate on the ADDIE model to deliver a first class education while supporting the broadening of our students.
Advances in technology have afforded new ways to deliver instruction to learners (Giesbers, Rienties, Tempelaar, & Gijselaers, 2013). Virtual classrooms and web conferencing have added increased capability to traditional brick and mortar models of instruction and provide ways to deliver instruction when physical presence is not possible. In the current project, distribute learning technology is analyzed for application to courses in human factors engineering. Our program involves a multitude of models that are graphically depicted. Most people have a preference for visual learning (Barbe & Milone, 1981). This is also the most sought after means of learning for engineering students (Anderson, 1991).

Web-conferencing (or video-teleconferencing-VTC) can provide an effective solution to bridging the gap between time and space for distributed learning. This helps provide alternative solutions for times when competing priorities or other barriers to physical presence are presented (Galusha, 1998). Web conferencing provides an easily distributed learning option that is straightforward. Communication is facilitated with the instructors and participants in a real-time fashion. A major benefit of web-conferencing is that travel time and costs are cut to nothing and result in significant savings (Simonson, Smaldino, Albright, & Zvacek, 2014). In today’s environment, this is especially attractive to DOD organizations seeking to still educate and train personnel in the most cost efficient manner. The U.S. military is reliant on distance education capabilities as a means to deliver mandatory training to its forces across the world while minimizing the cost to deliver that experience (Simonson et al., 2014).

E-learning tools are abundant today, and are continuing to grow at a fast paced in an attempt to keep up with demand for more flexible delivery of instruction. Tools are no longer limited to just audio or video of an instructor and their students. Now, classroom members are able to leverage video, audio, chat, and interactive tools to share and collaborate on different screens and different problems or projects as a part of course work in real or delayed time (Garcia, Uria, Granda, & Suarez, 2007). This presents different ways to become involved in the learning experience, and perhaps offers a more dynamic way through technological advances that facilitate collaboration across devices. While tools are helpful in giving different approaches
to interaction, it is the use of the tools that result in meaningful interactions with the class that help build motivation to learn and be engaged in productive ways (Roca & Gagne, 2008). Compliance with these new technologies is not as easily directed when delivery distance education since the instructor is not physically present to give directions and orders. However, a student’s motivation to use these tools as part of the function to be an engaged learning can increase their use and subsequent success in a course when actively participating with tools similar to how they would participate in class (Sorebo, Halvari, Gulli, & Kristiansen, 2009).

While providing cost and ease of access advantages, web conferencing tools also present significant disadvantages. Historical analyses indicate that distance learners may have significant mental barriers and personal insecurities to learning than their counterparts enrolled in traditional educational settings (Knapper, 1988). The lack of a physical presence in a classroom environment prevents the instructor and students from picking up on physical and other non-verbal cues that are evident in traditional classroom settings. Students are also in multiple locations where a distraction at one location such as a student being interrupted or stepping out of class draws attention away from the instructor. VTC hardware and software can be costly and resource intensive. Specifically, VTCs require significant bandwidth to have any sort of worthwhile fidelity that adds to the learning experience and not detract from it. This also necessitates having technical support available to keep the system operational. This adds to the cost of the overall system. This can be mitigated with commercial off the shelf web conferencing tools. If a VTC should fail, contingencies to continue learning are limited and may be as primitive as having a phone call with strictly voice (Simonson et al., 2014). This severely degrades the interactive benefits of visual stimuli.

There are multiple architectural variations of VTC. In its most basic form, it involves calling from one point to another. No call server is required to operate this type of communication, making it affordable and convenient for use. This system can be used by small classes or institutions with limited requirements to hold large meetings spread across multiple locations. Point to point teleconferencing is a practice many people with Internet connectivity and a computer can do today. Programs like Skype, Oovoo, and Google Hangouts, allow people to connect with one another as long as they have the appropriate software and hardware to operate the system. The Multi-party VTC system is more advanced than the point-to-point systems. Multi-party systems are built for larger organizations that require the capability to meet with larger groups of people spread across multiple sites.

Current VTC systems consist of the various setups. The National Security Agency identifies two types of VTC systems: dedicated systems and desktop systems (NSA, 2016). Dedicated systems are your more sophisticated systems utilized by larger organizations that require frequent meetings between groups in multiple locations. Dedicated systems are often seen in classrooms that conduct distance learning, or in command centers that have units dispersed throughout the battlefield. A desktop system is the basic form of VTC that many people today have experience with. The desktop system is a basic computer with add-ons that facilitate VTC with others. With the advancement of technology many add-ons are built into computers today, and programs to connect one another are easily accessible. Early editions of dedicated VTC systems were often expensive, and hard to use. As technology has advanced systems have become cheaper and more accessible to many small and large organizations. Key
components to today’s systems are usability and protection. The requirements to run these systems are an internet connection, hardware, and software. The advancement of technology has allowed people to now use these systems on the go via smartphones. An issue that arises with these cost-efficient and accessible systems is protection. There is minimal protection when using these systems, making peoples conversations vulnerable to hacking.

Additional issues present themselves for our students as they travel to areas with less robust network infrastructure than we are able to access in the United States. Sending our Cadets to places such as Mexico and China were informative in that these experiences highlighted that an assumption that bandwidth and network fidelity would hold were not completely true (Simonson et al., 2014). Security is an additional and essential aspect of this evaluation as our Cadets are traveling with a government computer that we are putting on sites that of varying levels of security as we are outsourcing the delivery with commercially available and licensed software and websites to gain access into a classroom experience.

A needs assessment provided the foundation for beginning an analysis of using distributed earning technology as a learning medium. In addition to the basic elements necessary to conduct a needs assessment, several other factors have been addressed to close the gap in having an effective distributed education delivery in a learning environment. First, it is important to look at the target audience technological proficiency to determine if they will be able to use the medium effectively without taking away from their learning experience by shifting attention to system usage versus material presentation. In the case of the Engineering Psychology Program, students typically are selected for semesters abroad based on high-performance in the classroom. Additionally, their technological abilities are strengthened through core computing classes and daily interactions with similar technology to communicate socially. Classroom dynamics for the setting will drive whether an androgogical or pedagogical approach should be used. (Simonson, 2014). If the instructor will be the center of attention, then VTC-like solutions are a great option. However, if group breakout discussions are needed, then VTC-like may not provide the right solution. This has significant implications in a setting such as USMA where the classroom is flipped and learning is heavily dependent on students’ application through participation and conversations in class.

Mobile platforms offer greater accessibility for the user population; however, fixed-station sites offer more isolated places for students to focus on the instructor. Bandwidth and resolution lead to fidelity of the video (Greisbers et al., 2012). This has an obvious effect of increasing the quality of the presentation and providing more attention as distortion would not disrupt the session. As the NSA’s Information Security Directorate points out, the need for cyber security is a must for VTCs (NSA, 2016). This is applicable in the military learning environment due to the sensitivity of some of the material presented.

The initial evaluation of the approach of using Blackboard and Google Hangouts to deliver instruction at a distance has given indications that this is a sustainable solution moving forward. Interface affordances need to be prevalent to mirror a traditional brick and mortar approach to learning. Speaking, raising a hand, collaboration, writing on a virtual chalkboard, and other things that happen in a real classroom should be afforded to the instructor and student to provide as real of a feel as possible. Simply watching a screen and PowerPoint detracts from the other multipliers that a classroom provides. Much like regular classroom environments, feedback is essential to both the learner and the educator. This two-way communication can be
delayed while supporting distance learning, but ensuring that it is present no matter what the education delivery medium is remains paramount in instructional design (Simonson, 2014). While distributed learning technologies provide great ease of access and convenience to support semesters abroad, several key factors do not lend it to be the only substitute for traditional brick and mortar models for educational delivery.

**Analysis of memory and impacts on distributed learning**

Human memory has three key processes that help us understand how we are able to remember things: encoding, storage, and retrieval. Encoding is the process of developing a memory code. Encoding is heavily dependent on attention resources. Attention is a finite resource as seen with Wickens (1992) Model of Information Processing. The more attention that is placed on stimuli, the more interaction working memory and long-term memory will have with each other.

![Figure 2. Wickens Model of Information Processing (1992)](image)

This initial process of encoding then leads to storage. According to Wickens, storage deals with saving encoded information over a period of time. This deals with keeping information in long-term memory stores for future use. The final process of understanding memory is retrieval or recall. This involves being able to access information from memory stores.

Attention involves focusing in on specific stimuli or events. This has obvious differences when evaluating the learning of students in the classroom as opposed to their peers learning via a distributed environment. Attention plays a significant role when gauging the rates of encoding as the model of information processing indicates that later recall is incumbent on proper functioning of these processes for a stimuli. In this instance, that would be the educational
material delivered to the student learner. Maintaining a student’s attention when they are learning via a distributed learning technology has historically been a challenge (Sorensen & Baylen, 2000).

Storage is affected by the development of schema. Schema is an organized cluster of knowledge about particular objects or events based on previous experience (Wickens, 1992). Schemas help us remember things that are consistent with our learned pictures of things. Moreover, schemas help us recall things that violate what we perceive to be within our expectations. This has a residual effect of diverting attention to the stimulus since it is different. This then feeds back into the information-processing model to be stored in long-term memory with the additional attention working with it to form a new schema. Students have schemas on how their education should be delivered (Simonson, 2014). This has been reinforced in them since they have been in school. Taking them away from this model and introducing a new way to learn can present a different set of challenges, but an analysis of their motivation and the factors that got them selected for semesters abroad can help predict their success while away from the traditional classroom setting at the Academy.

The final process in human memory is retrieval (Wickens, 1992). This is the process by which we are able to access stored memories. Different factors aid in this process, namely various types of cues to help recall items by using multiple resources in concert to remember something. Conversely, multiple factors that detract from recall can also influence the level of recall. This is called interference. There are two types of interference: proactive and retroactive. Proactive interference occurs when previously learned information interferes with new information. Retroactive information deals with new information interfering with previously learned information. Implications for our students include learning a completely different language and having to maintain proficiency in that language as they take courses in a traditional classroom abroad. At the same time, we expect them to be able to retrieve information that they learned in previous courses as USMA in order to build upon their knowledge in our major as the progression from course to course continues to build.

The extent to which they recall items from their education will vary to the extent to which they pay attention in class or to the material if an asynchronous class attendance is necessary. This focuses their encoding and storage on different areas from the onset. It is important to stress that the same key elements that make a student successful in a traditional classroom will also help continue their success if they adhere to the same principles. The information processing model helps explain that teachers need to ensure that grabbing and maintaining the attention of their students is important to ensure proper memory storage and retrieval of course material.

**Motivation as an enabler to distributed learning**

Students selected for the semester abroad program compete early on in their time at the Academy. This has several implications and meanings for different organizations. Cadets must perform at high levels early in their 47-month experience in order to be competitive for selection to the program. Further, they must perform due diligence in order to select an academic major that will be able to support a semester abroad without causing a significantly detrimental
experience for the cadet in one or more of their semesters (additional classes that have the potential to create a burden in satisfactory completion). While cadets are able to receive credit for certain classes that they take when they are away, they have to ensure that classes that they need to take for their major are either substituted or programmed in to their course of study via an approved waiver from their program.

All of these factors logically point to a key factor that is woven throughout the theme of this paper: motivation. Motivation plays an integral role in self-regulation and self-monitoring (Bell & Federman, 2013). Student motivation has a significant impact on performance and satisfactorily completion of distance learning programs (Galusha, 1997). While seemingly intuitive, it is worth analyzing some factors that help define motivation as it applies to a distributed learning environment.

Deci and Ryan’s (2002) Self-Determination Theory (SDT) deals with intrinsic and extrinsic motivation. Intrinsic motivation deals with internally, or self-regulated, driven behavior that stems from a desire to better oneself strictly for the reward of that betterment. In contrast, extrinsic motivation produces drives to achieve homeostasis in our physiological state in order to avoid punishment or to receive rewards. Extrinsic motivation is regulated to three different processes which vary in self-identified behavior. As one proceeds through these levels, they move towards internally regulated behavior that is found in intrinsic motivation.

Self-Determination Theory comprises three key elements: competency, autonomy, and relatedness (Deci & Ryan, 2002). Competency deals with one’s ability to engage in a behavior such that they can accomplish a task successfully. Autonomy is the independence that one is given in accomplishing a task. When competency and autonomy needs are met, then one can begin to look for relatedness. With relatedness, meaningful bonds are put at a premium and help bring about relationships based on a new found ability to accomplish a task independently. A person can seek bonds with the person that gives them the freedom and support to accomplish a task or to be with like-minded people who seek to accomplish a task in the same manner. These factors then correlate with levels of intrinsic and extrinsic motivation.

While a vast body of work has been focused on the student, their motivation, and other factors, other interesting insights look at motivation from other perspectives. Specifically, it is worth investigating the motivation that a teacher has to use new technologies and capabilities to teach their classes since they might be even more removed from technological solutions due to time away from receiving their formal education. Sorebo et al. (2009) sought to model self-determination theory as it applied to a teacher wanting to continue to use e-learning tools as a part of their instructional design and delivery (Figure 3).

According to the components of Self Determination Theory and the proposed framework for educators in Figure 3, it is practical to analyze instructional design through this lens. Specifically, instructors can greatly benefit from analyzing their use of distributed learning technologies as they relate to SDT. Competency in these capabilities can increase if the institution places a premium on delivery of content through these methods. Instructors’ autonomy in directing their classes will build their perception of usefulness and increase their
intrinsic motivation to continue using technologies to support their distance learning teaching plans. Competence has the ability to build familiarity and comfort in using the instructional methods proposed in distributed learning technologies. As satisfaction builds, there will be a trust in automation that increases and consequently, there might be an increase in use of these technologies. Finally, as teachers are able to relate to their students, they might also find value in relating to others in their programs that send students abroad but that have to be innovative in the ways in which they reach their students across time and space. A combination of all these factors can help determine if the teacher will continue to use these capabilities. If they decide to do so, resources should be dedicated to increase effectiveness. If they choose not to, reasons for not doing so should continue to be analyzed in order identify gaps and to build better instructional designs for students going abroad.

![Figure 3. Sorebo et al.’s Model of Self-Determination Theory for Teachers and Use of E-Learning Technologies (2009)](image)

### Application to future teaching at USMA

While the present work examined the effects of distance learning technologies for supporting cadets on semesters abroad in different countries, there are certainly applications for the traditional classroom that can be used to help increase teaching effectiveness. As technology in the classroom becomes more prevalent, it is incumbent on instructors to assess where and if using these technologies supports their instructional design. As generations grow up with more technology ubiquitously placed in their lives, it might make sense to incorporate these items more in the classroom. This can carry over to distance learning as conversations and interactions naturally are occurring through these more often than not anymore.

The models in this review can be viewed as complementary. An instructor’s intrinsic motivation to deliver content via e-learning technologies can directly influence a student’s motivation to engage in class. This has direct implications on their attention and the information processing model that will determine the extent of their learning of the material. Whether they are abroad or in the same room, it is imperative that teachers ensure that they are reaching all students and gaining their attention. While instructional means may vary drastically, the content
of the delivery cannot. Gaining attention and maintaining it is imperative and must be found as a naturally occurring trait in individual instructors.

Teaching across time and space poses significant challenges. Instructors can leverage understanding of human behavior to not only reach their students, but to also increase their own self-efficacy in delivery material to their students near and far. It is important to understand that while the classroom may look different, still delivering quick and personal feedback remains essential. Assessing instruction and catering to different intelligences and learning styles is still a key component of being an instructor. These will have to mold to the future of the classroom as technology increases, but at their core, these elements cannot suffer from a change in approach. As broadening opportunities continue to grow for our cadets, it is essential that we leverage those tools and solutions that will meet our students’ educational needs while continuing to develop them as leaders of character during their 47-month developmental experience.
References


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