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Evaluating Student Use Patterns of Streaming Video Lecture Capture in a Large Undergraduate Classroom

Nathan E. Whitley-Grassi
Walden University

Walden University

College of Education

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Nathan Whitley-Grassi

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Review Committee
Dr. Kay Persichitte, Committee Chairperson, Education Faculty
Dr. Paula Dawidowicz, Committee Member, Education Faculty
Dr. Andrew Thomas, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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by

Nathan E. Whitley-Grassi

MA, State University of New York University at Buffalo, 2007

BS, Armstrong Atlantic State University, 2004

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Large classes that allow smaller amounts of instructor-student interaction have become more common in today's colleges. The best way to provide needed opportunities for students to overcome this lack of interaction with instructors remains unidentified. This research evaluated the use of video lecture capture (VLC) as a supplemental method for teacher-student interaction and what, if any, impact it and attendance have on student performance in large lecture courses. This ex post facto study conducted at a Northeastern research university utilized cognitive and andragogical frameworks to examine the relationships between the independent variables frequency of video viewing, quantity of videos viewed, and course attendance, as well as their impact on course performance in a large lecture course (N=329). Data sources included archival data from the learning management system and student survey responses. Analysis included a series of two-way ANOVA tests. The results indicated that the frequency of video viewing was found to have a significant positive effect on course performance ($F = 3.018$, $p = .030$). The number of VLC videos not viewed was also found to have a significant negative effect on course performance ($F = 1.875$, $p = 0.016$). Other independent variables were not found to have any significant main effect or interaction effect with the dependent variable, course performance. Findings from this research may be used by educators, students, and administrators planning course sizes and availability to better understand the relationship between these variables and how VLC can be used effectively in large lecture classes thus leading to improved efficacy in VLC use.

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Chapter 1: Introduction to the Study

In this study, I examined the use of video lecture capture (VLC) in the unique learning environment of large undergraduate lecture classes. This technology uses video recordings of face-to-face lectures, and provides streaming or downloadable videos to students through a web interface that is typically embedded in a learning management system. There are several commercial options for VLC software. Though they all vary in set up, in most cases student will see a recording of the instructor and any presentation slides in a side-by-side or picture-in-picture view. VLC is increasing in popularity, and its widespread use requires a better understanding of its pedagogical implications. This study could be used to inform administrators' and institutions' decisions regarding how VLC can be most effectively used to improve student outcomes. In this chapter, I detail the background, problem, and research questions.

Background

This research was based on a pilot study of voluntary survey data conducted by Whitley-Grassi and Baizer (2010). The researchers found that student use of video lecture capture positively correlated to course performance and attendance patterns in a large physiology lecture class ($N = 128$). The Whitley-Grassi and Baizer pilot study employed a Mann-Whitney ranked order test and indicated that students who primarily attended class to acquire the information, and who used VLC as a supplement, performed significantly better in the course than those students who used VLC as their primary mode of viewing lecture material ($p = 0.048$). Results also indicated a positive correlation between student attendance and VLC use with overall course performance.

The researchers in the pilot study employed a simplified survey instrument, and the pilot was done with a smaller sample than the sample in this study. According to Whitley-Grassi and Baizer (2010), little research exists examining the same link between VLC use, attendance, and course performance in large lecture classes. Whitley-Grassi and Baizer found that there was a relationship between video usage and course grades. However, in the pilot study, the researchers did not consider a three-way comparison examining attendance, video usage, and the interaction with performance, which left room to expand on the hypothesis and offer a more refined methodology and analysis to better explain relationships between the variables.

Much of the existing research on VLC has focused on samples of less than 100 participants, or on a blended or online delivery model (Fang & Pursel, n.d). In this dissertation study, I have supplemented the existing literature by examining this issue in a larger scale lecture classroom, and by examining the use of video lecture capture in a traditional face-to-face course setting.

Problem Statement

Through this research, I intended to address the gap in the literature regarding how students use VLC in large undergraduate lecture courses and the effect of attendance on course performance. How students used VLC was measured by both the frequency and quantity of video viewing to establish a pattern of use. Many major institutions have begun to record audio and/or video of large lectures and allow students access to these recordings via web portals, content management systems, or learning management systems (Chandra, 2011; DeNeui & Dodge, 2006; Dey, Burn, & Gerdes, 2009; Simpson,

2006; Woo, et al., 2008). This new phenomenon has been met with skepticism and sometimes fear from many faculty and administrators concerning possible negative impacts on classroom attendance. However, other studies have reported that this has not been the case (Dey et al., 2009; White, 2009).

In this study I sought to examine the use of VLC and its implications on student engagement and course success. Many academic institutions are interested in VLC as a solution to the problem of overcrowded course sections. VLC could represent near limitless potential for these sections to grow beyond the seat capacity of the classroom. Establishing the patterns of use of VLC in large lecture classrooms informs the academic community about the impacts of various use patterns of VLC. Further, I sought to fill the gap in the existing literature by examining and distinguishing between patterns of student use (frequency and quantity of video viewing) of VLC, and to determine what, if any, interactions exist between the quantity and frequency with which students view videos, student attendance, and student final course performance. Performance was measured based on the students' abilities to meet learning objectives in the course, as demonstrated by final course grades.

Purpose of the Study

My goal in this research was to gain a better understanding of how students use VLC in large undergraduate lecture courses and the effect of attendance on course performance (see Tables 1 and 2). This quantitative study drew from archival data gathered at a major (R01) research university. My intent was to compare variables (frequency and quantity of video viewing and student attendance) with course

performance, and use statistical analyses to investigate interactions among the variables. I coded each student for attendance (see Table 2) and video use (based on percentage of total videos viewed and number of times each video was accessed) for comparison with course performance. Ultimately, I sought to determine which pattern or patterns best supported student performance, as indicated by final course grade, in the larger lecture hall teaching model. The findings of this study help faculty and administrations of institutions of higher education better use VLC and similar technologies to improve and support student learning. Further, this study may lead to additional research in and development of best practices for the use of VLC technology.

Table 1

Variable Definitions

Variable	Definition	Categories / Range
Quantity of videos viewed	Number of video views (click count) by quartiles compared to the rest of the population.	1st, 2nd, 3rd, 4th quartile.
Frequency of video viewing	Average days of week that videos were viewed.	0-3.75 days / week
Attendance	The percentage of class meetings that the student attended.	never, < 25%, 25-50%, 50-75%, 75-100%

Table 2

Quantity vs. Attendance

		Video viewing 0-25%	Video viewing 25-50%	Video viewing 50-75%	Video viewing 75-100%
		1	2	3	4
Attend >75% of lectures	A	A1	A2	A3	A4
Attend 50-75% of lectures	B	B1	B2	B3	B4
Attend 25-50% of lectures	C	C1	C2	C3	C4
Attend <25% of lectures	D	D1	D2	D3	D4
Attend none of the lectures	E	E1	E2	E3	E4

This was a quantitative study in which I examined secondary archival data to explore patterns of student use of VLC to determine if interactions exist between student attendance and patterns of use affecting student performance. Specifically, I examined archival data collected at a major research university in the northeastern United States. The data consisted of student course grades, when and how many times each video lecture was accessed by each student, and responses to a voluntary survey completed by students regarding their attendance. These data were generated and compiled using a

learning management system and a survey conducted in this course. Each datum was assigned to one randomly generated ID number for each student.

The data from the archival survey of students consisted of several closed-ended questions (see Appendix C). My primary point of interest in the survey was in self-reported student attendance data. I examined reports generated from the learning management system, as well as student survey responses to questions about their use of the VLC component of the course that was made available through the learning management system. Additionally, I determined patterns of use for each student. Attendance data from the archive were collected using a more refined survey instrument than the one originally used in the Whitley-Grassi and Baizer (2010) study. These data were archived by the university. In this study, I examined the variables listed in Table 3.

Table 3

Identification of Independent and Dependent Variables

Independent variables	Frequency of video lecture viewing	IV_1
	Quantity of video lecture viewing	IV_2
	Student attendance	IV_3
Dependent variable	Course performance	DV

Research Questions and Hypotheses

Research Question 1: Are there differences in course performance (DV) based on frequency of video lecture viewing (IV_1)?

- (Frequency of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on frequency of VLC video viewing.

H_1: There will be significant difference in course performance based on frequency of VLC video viewing.

Research Question 2: Are there differences in course performance (DV) based on the quantity of video lectures viewed (IV_2)?

▪ (Quantity of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on the quantity of VLC videos viewed.

H_1: There will be significant difference in course performance based on the quantity of VLC videos viewed.

Research Question 3: Are there differences in course performance (DV) based on student attendance (IV_3)?

▪ (Student Attendance Main Effect)

H_0: There will be no significant difference in course performance based on attendance patterns.

H_1: There will be significant difference in course performance based on attendance patterns.

Research Question 4: Does course performance vary as a function of the frequency of VLC viewing (IV_1) and attendance (IV_3)?

- (Frequency of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

H_1: There will be significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

Research Question 5: Does course performance vary as a function of the quantity of video lectures viewed (IV_2) and attendance (IV_3)?

- (Quantity of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

H_1: There will be significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

Theoretical Framework

The cognitivist theoretical framework seeks to move past the idea that humans are preprogrammed animals wholly dependent on environmental factors to guide their intellectual development. Rather, in this view, humans are dependent on individual cognitive processes for guidance in their own learning and development (Vygotsky, 1993). Bandura (1977) and Knowles (1990) both have suggested that the motivation of learners is directly tied to their ability to learn. In my study, the motivation of the student

may have affected the VLC usage choices of the student, and these choices may have affected the students' ability to learn and, by extension, their performance in a course. How students used VLC in these large lecture classes was dependent on student choice and motivation. In Chapter 2, I will further discuss various connections between the andragogy, the cognitivist theoretical framework, and other research on student use of VLC. In this study, I examined possible combinations of use for VLC and how course performance might be supported and improved in large undergraduate classrooms.

Nature of the Study

Data sets were drawn from archival data generously provided by a large research university in the northeastern United States. The original data were collected from a two-semester series of undergraduate senior-level Human Physiology courses in the Spring 2010 semester. According to the professor of the course, the majority of students in this course was accepted to, or had applied to, the Pharmacy doctoral program. The archived data collection was supervised by department faculty and administrators and approved by the IRB of that institution. The archival sample included over 300 participants' survey responses, video usage data, and course grades. Archival data also includes the date and number of times that each VLC was viewed by each student. The institution removed identifying student information prior to releasing the archival data to maintain student anonymity for this dissertation research. For this study, I included all complete records (students who completed the course and the survey) from the archival sample.

The two-way ANOVA allowed me to determine any main effect of each independent variable (IV) on the dependent variable (DV), as well as any interaction

between the independent variables. I examined standardized scores (percentage) of the final course grades as an indicator of course performance. As noted in Table 3, frequency of video lecture use (IV_1) was defined as the number of times over a given period the student watched any video, converted into quartiles (using a quantile normalization; see Bolstad, Irizarry, Astrand, & Speed, 2003). Quantity of video lectures viewed (IV_2) was determined by the percentage of all available video lectures each student viewed. Attendance (IV_3) was categorized from student self-reported attendance data.

Definitions

In this study, I examined several variables (see Table 3). The independent variable *frequency of video viewings* is a reference to the number of times a participant viewed any of the video lectures over a given timeframe. This number was then normalized to place each score into one of four categories by quartile (see Bolstad et al., 2003). In this case, I did not consider the nature of the specific video, nor did I consider the variety of videos. The independent variable *quantity of videos viewed* related to the number of video lectures viewed in a given week taken as an average over the length of the course.

The independent variable *attendance* was the self-reported attendance of the participants. Data were collected from each student asking them to rank themselves into categories (never, <25%, 25-50%, 50-75%, or >75% of total classes attended). The dependent variable *course performance* was defined as the overall course grade.

Assumptions

I made several assumptions in this study. Given that the data were composed of an archival download exported from a learning management system and voluntary

surveys conducted by staff at the university, I had to trust that the data collected were accurate. Given that staff members who collected and compiled the data are experienced in data collection, and that the collection occurred under the guidance of the local university IRB, I assumed that the data were accurate and ethically collected. Beyond the assumptions regarding data collection, I also assumed that students responded truthfully on the surveys, and that their reported attendance levels actually mirrored their class attendance.

Scope and Delimitations

In this study, I sought to identify factors that may influence the effective use of VLC. Specifically, I sought to determine patterns of VLC use that were associated with high success in a large lecture classroom. The values of *frequency of use* and *quantity of video lectures viewed* were selected because they, when taken together, provided a more valid representation of how students used the recorded videos. Independently, neither of these variables provided a complete picture of the pattern of VLC use. Neither viewing frequency nor quantity alone would differentiate between a student who watched the first video one hundred times and a student who watched 50 different videos two times each.

The population of this study was chosen as a convenience sample, given that I used archival data from students enrolled in the course for the terms that were used to create the archive. According to the professor of the course, all students who volunteered to take part in the end of course survey conducted by university staff were included; those who opted out of the survey were excluded, though only one student opted out. Personnel at the university collected the data to compile this archive. The archive that they provided

me for this study consisted of a de-identified population; identifying information was not made available. The gender and age of the students in this archive were "similar to the university community as a whole" (see Whitley-Grassi & Baizer, 2010).

The archive contained data from several hundred students at a typical large research institution. But even though the sample size was larger than that of similar studies (Bollmeir, Wenger, & Forinash, 2010; Grabe & Christopherson, 2008), since this was a convenience sample of only one course section, the findings are confined to this group and cannot be generalized to a larger or different population.

Limitations

The greatest limitation in this study was that the data were archival. The validity of this study may have been impacted by the quality of the original researchers' data collection and processing techniques. Given the archival nature of the data, I could not modify the questions asked of original participants. Participants' information was de-identified, and gaining additional information about participants beyond what was provided by the university was not possible.

There may have been reporting bias or error, given that attendance data was self-reported. The archived data collected from the learning management system did not contain bias. These data were generated electronically with no opportunity of biasing the collection of frequency or quantity of video lecture usage. Also, course performance was statistically calculated to limit the chance for bias.

In any study where surveys or interview methodologies are used, the possibility for deceit from participants is possible, but it must be assumed that the students in these

courses were as truthful as possible with their self-reporting. In addition, positive elements of the methodologies such as sample size and electronic automatic data collection decreased researcher bias and threats to validity.

Significance

Results of this study could be used to inform the use of VLC technology in large lecture classes. It was important to determine what, if any, impact attendance and video lecture usage have on course performance in large lecture courses. Hopefully, the findings of this study help instructors and administrators to better employ VLC in ways that improve student performance. In addition, the findings may also be used to inform students on best practices for the use of VLC technology in order to ensure their own success. The large sample size created an opportunity for highly generalizable findings that could inform practice beyond the large physiology classroom with potential application in a variety of courses.

Summary

In this study, I examined the interactions between the quantity of VLC videos that students viewed, the frequency with which VLC videos were viewed, and class attendance on course performance. I used two-way ANOVAs to explore the main effect of each independent variable on the dependent variable, as well as interactions among the independent variables.

Results from this study provide a valuable tool for educators and administrators when making decisions about designing classes that employ VLC lecture delivery and promote best practices for students. Recent studies of the variables I studied have varied

widely in methodology, conceptualization of variables, and impact on learning. In the next chapter, I discuss similarities and differences in the research methodologies and variable conceptualization.

Chapter 2: Literature Review

In this study, I addressed the gap in the literature that existed regarding how students use VLC in large undergraduate lecture courses, and what effect attendance, frequency of viewing, and quantity of viewing video lectures (patterns of use) had on course performance. Many major institutions have begun to record audio and/or video of large lectures and allow students access to these recordings via web portals, content management systems, and learning management systems (Bozzhardt & Chiang, 2016; Chandra, 2011; Copley 2007; Dey et al., 2009; Simpson, 2006; Woo et al., 2008). The use of VLC in lecture classrooms has been regarded indifferently by many faculty and administrators due to the perceptions of possible negative impacts on classroom attendance, even though studies have indicated that students prefer or better enjoy this type of content delivery (Tang & Austin, 2009). While some institutions are recognizing the potential value of VLC as a study support to students, others are specifically using VLC to support students with disabilities (Watt, Vajoczki, Voros, Vine, Fenton, & Tarkowski, 2014). After examining the literature, I found evidence that attendance has not been negatively affected (Dey et al., 2009; White, 2009).

The purpose of this research was to identify and distinguish between patterns of student use of VLC, and then to determine what, if any, interactions existed between the frequency of video lecture use (IV_1), quantity of video lectures viewed (IV_2), attendance (IV_3), and course performance (DV). Performance was measured based on the final course grades. I used a standardization of course grades as a proxy for course performance.

Literature Search Strategy

I compiled a detailed list of literature to review using searches of several online databases and search engines. The primary database and search sources include Education Research Complete, Education and Information Technology Library, and Google Scholar. Education Research Complete is a database that is part of EBSCO Host. Education and Information Technology Library contains articles and conference papers from the Association for the Advancement of Computing in Education (AACE), and Google Scholar is a Google product designed to search broadly for scholarly and peer-reviewed work.

I used several different search terms in a variety of patterns to maximize relevant results and minimize superfluous ones. Primary search terms included: *video lecture capture, lecture capture, lecture recording, streaming video, classroom recording,* and *watch online.* As this is a relatively new technology, there was no need to restrict searches to specific dates. The earliest relevant search results were published in 2007. References primarily include peer-reviewed journal articles, but also conference proceedings, white papers, as well as institutional and personal communications.

Given the relatively short history of this technology, I also reviewed citations for other related technologies such as podcasting and audio recordings. Searches were purposefully broad in order to capture sources from various fields including higher education, K-12 education, international language learning, business training, and professional development.

Theoretical Foundations

I examined VLC use through both the cognitivist and andragogical theoretical frameworks. These frameworks enabled me to contextualize VLC given that the technology requires a cognitive process of information processing when a user views of the videos. I selected the andragogical framework because the participants in this study were college-aged students and therefore strongly influenced by adult learning theory.

Cognitivist Theoretical Framework

Lev Vygotsky is often cited as the primary cognitivist theorist. In a considerable portion of his writing, Vygotsky described how people learn using their own memory, attention, abstraction, and thought (Vygotsky, 1993). This, in addition to his theories relating to the importance of learning in a social context, has resulted in a scholarly consensus that Vygotsky was a "social cognitivist." In the cognitivist school of thought in general, and specifically in the work of Vygotsky, the focus of learning is on the internal processing of ideas. The cognitivist theoretical framework seeks to move past the idea that humans are pre-programmed animals wholly dependent on environmental factors to guide their intellectual development (Skinner, 1938), and holds that humans are dependent on individual cognitive processes for guidance in their own learning and development.

Active learning. Vygotsky (1993) held that acquiring new knowledge was an active process, as opposed to knowledge developing or being transferred into the brain. He argued that the process of exercising the intellect causes variations in the senses and constitutes the intellect at the individual level (Vygotsky, 1993). The form that this

exercise for the mind takes is that of active learning. He supported this claim in his description of multiple stages of behavioral development. Vygotsky's theory of cognitive development embraces not just the concept of hereditary, instinctual knowledge acquisition, but also that of the rational mind of humans. Active learning is accomplished through the application of abstract thought. Abstract thought, on the other hand, is only accomplished when the learner achieves mastery over memory and attention (Vygotsky, 1993).

Knowles (1990) also emphasized activity in the learning process, similar to the connectionist stimulus-response (S-R) theory of Thorndike (1905). S-R theory, according to Knowles (1990), suggests that the role of the learner is active as opposed to passive. In addition, Knowles' (1990) adult learning theory places more emphasis on the social aspect of growth and development than on the influence of environmental stimuli. Both of these points were relevant to this study in which I compared students who attempted to learn from a process of passive viewing of VLCs to those who had the potential for both social and interactive stimuli.

Zone of Proximal Development. The zone of proximal development is often described as the performance gap between what a learner can do with and without help (Vygotsky, 1978). This concept places importance on the social processes behind learning. According to Vygotsky (1978), the imitation of learning is a more social process, which inherently involves variable levels of instruction from members of the society with more experience. In this scenario, when new learners are first introduced to a task or topic, the level that they can perform it will be lower in the absence of support or

subtle reminders from other individuals. This gap in performance is where Vygotsky (1993) first suggested the zone of proximal development (ZPD). Similar to Vygotsky's ideas, Piaget's ideas of cognitive development included a strong focus on individual discovery and experimentation (1978). Both theories underscore the importance of social interactions during the learning process. The use of VLC supports the zone of proximal development theory in terms of how course performance might differ based on how students use VLC.

Piaget & Cognitive Development. Both Piaget (1978) and Vygotsky (1993) asserted that the development of behavior, or the development of changes in behavior, must happen slowly. Vygotsky (1993) described the process of learning as an organism being exposed to the clouding effects of the outside world, which change the individuals' perceptions. Piaget (1978) used a more abstract description of the acquisition of knowledge when he discussed the idea of the modification of the phenotype, or phenocopy. One example is that some environmental or external factor provides some influence on an organism, and they make a phenotypic change in behavior due to this new familiarity with the outside pressure (Piaget, 1978).

Both Piaget (1978) and Vygotsky (1993) described the same process, just from varying levels. While Vygotsky (1993) spoke of learning and behavior on the individual level, Piaget (1978) spoke in a more theoretical, evolutionary sense. Piaget (1978) postulated that intellect, and by extension behavior, could be modified over time by exposure to external influences. One other point regarding the development of behavior that was echoed in both these theorists' works is the idea that behavior, as we think of it,

appears in variable levels of complexity. Vygotsky (1993) described the shadows of complex human behaviors, such as anger or anxiety, in lesser animals and in other simple organisms. Even within the life of the organism, the level of complexity of its behaviors changes as it develops from child to adult (Vygotsky, 1993). Both of these theorists agreed that these changes take place over time and resulted from exposure and changes in environmental factors (Piaget, 1978).

Andragogical Theoretical Framework

Knowles (1990) described several examples of how adult-centered learning should be approached differently from child-centered learning and noted, "Adults are motivated to learn [only when] they experience needs and interests that learning will satisfy" (p. 31). Adults will most easily learn those ideas or concepts that they find interesting, or that are most relevant to their lives. An individual's true interest in the topic being studied promotes learning, especially in adult students.

Bandura (1977) and Knowles (1990) both have suggested that the motivation of adult learners is directly tied to their ability to learn. In this case, the motivation of the student may affect her or his VLC usage choices, and these choices will affect the student's ability to learn, and by extension, course performance.

Pedagogy and Andragogy. Pedagogy is usually defined as the methods that are employed to instruct children (Knowles, 1990). One of the primary characteristics of pedagogy is the idea that the teacher or educator holds responsibility for what is learned, how the learners will study it, and when learning will take place (Knowles, 1990). Pedagogical models are based on two assumptions. First, learners will accept that they

need to learn what the teacher tells them. The second assumption is that the teacher views

themselves as the dominant authority, and therefore the learners will assume dependent

personality archetypes (Knowles, 1990). According to Knowles (1990), if the

pedagogical model is followed, then the dependency of the learners will decrease year by

year as they progress through school, while "their need and capacity to be self-directing .

. . increases rapidly" (p. 55).

The concept of adult learning or andragogy is considerably different from the

principles of pedagogy. This difference is often overlooked by educators and professors

in higher education. Learning styles of college students fall into a transition period

between the time when students learn using pedagogy and begin to adopt the

andragogical model. Adults need to understand why they need to know something before

they will learn it, and adult learners need to have a feeling of responsibility for making

their own educational decisions (Knowles, 1990). Adult learners possess more life

experiences than children, and those life experiences give them a much different outlook

on learning (Knowles, 1990). Some adults only desire to learn new information once

there is an immediate need for that information in their lives (Knowles, 1990). This

supports the idea that some adults desire to limit their learning to those concepts that have

real life application with potential to affect their lives (Knowles, 1990).

Adult learners have been exposed to greater and more varied life experiences than

children. It is because of these experiences that adults, to a greater extent, shape the way

they learn. With a greater pool of experiences to pull from, adult learners have a greater

understanding of many topics, even if it on a very basic level, because of some previous

exposure. Instruction that comes across as "life centered" or "has a direct relationship to the learner's" daily life provides the most effective units of organization that an adult learner could use to facilitate learning (Knowles, 1990, p. 31).

In relation to the differences between adults and children, Knowles argued, "Adult learners, unlike children, have a desire to be self-directing" in their learning (Knowles, 1990, p. 31). While "the pedagogical model assigns to the teacher full responsibility for making all [the learning] decisions" (Knowles, 1990, p. 54), the andragogical model leaves much of the responsibility for and decisions about learning to the adult. Maintaining a level of autonomous activities allows adult learners to feel like they are in control of their own progression of learning. This model of learning moves the educator to more of a facilitator role, which allows the educator to gently direct adult learners in the material while enabling the learners to play a greater role in directing the flow of their own learning.

Adult learners require a different type of motivation to learn than children. Adult learners frequently want to know why they need to learn each lesson (Knowles, 1990). This is often incorporated into adult learning through practical applications of the material being studied such as in the case of higher education in the form of a lab or practical application or field experience. These opportunities allow learners to see how and when they will apply the lessons they are learning in their own day-to-day lives or, more importantly, within their careers.

Knowles (1990) pointed out that our own self-concept is a major factor in our success or lack thereof as a learner. In our society, it is accepted that it is the duty of the

child to learn and the duty of the adult to work. If we can change the self-concept to place additional importance on learning as an adult, perhaps make it an equal to your occupation and obligations to your family, then you will likely be a much more successful and motivated learner (Knowles, 1990).

Perception of time also varies considerably as we mature. We do not perceive our lives the same when we are relatively young adults; say 21, as when we have much more memory to draw from, say at age 75 (Knowles, 1990). Since motivation is a major factor that drives adult learning, there will likely be variance in a person's level of motivation to learn based on their own perception of their place in time.

Knowles (1990) also suggested that with age we lose the sense of "discovery" that is often associated with youth. If this "sense of discovery is retained, or even fortified, it could lead adult learners to be more receptive to learning" (Knowles, 1990, p. 158). Knowles suggested that adults follow the "law of least effort" which tends to drive us toward the familiar rather than the novel and new (Knowles, 1990). This path deprives us of the new experiences that could change the response we have to learning stimuli. Fostering the sense of discovery may cause adult learners to shy away from this path of least effort.

Reactive vs. Proactive Learning. Reactive learning is the process by which we are too often expected to learn as children (Knowles, 1990). This is usually accomplished by a traditional classroom teacher delivering material lecture style (Knowles, 1990). Reactive learning has a specific set of required conditions and skills. Required conditions include: a willingness to be dependent and to some extent subordinate to the teacher, viewing

learning as a means to an end (the completion of a program or degree), and perhaps the

most disturbing, a competitiveness between students (Knowles, 1990). Learning under

these conditions fosters a specific set of necessary tools for learners. These tools include

the ability to retain information, take notes, and predict exam questions (Knowles, 1990).

This type of learning excludes the active learning process that is almost essential to

maintain learner motivation for adults. For this reason, the "teacher lectures, student

memorizes" teaching style often found at the college and university level seems ill suited

for their adult learning audiences.

Proactive learning can be facilitated by a variety of sources, life experiences,

printed material, or other experts in that field (Knowles, 1990). The conditions required

for proactive learning are much more varied than in reactive learning. They include

formation of collaborative relationships, a commitment to personal growth through

learning and a healthy spirit of inquiry (Knowles, 1990). In many ways this learning style

parallels adult learning theory, as it requires learners to take an active role in their

learning. The skills fostered by proactive learning are also more diverse than in reactive

learning, and can often have broader applications in the real world lives of learners

(Knowles, 1990).

Learning through Modeling

Bandura (1977) places a strong emphasis on social learning through behavioral

modeling. He observed that behavioral modeling is not just of the act trying to replicate a

behavior, but is also of the attitude and emotional factors of the event being modeled as

well (Bandura, 1977). The idea of learning through observation and modeling potentially

spares the learner needless errors associated with experimentation.

According to Bandura (1977), the process of modeling involves several steps. The first is attention; the learner must devote some level of attention to observing what is to be learned. Bandura further suggested that this needs to be conscious involvement in order to truly enforce the learning process. The learner must have some ability to retain the behaviors observed over time and to have an accurate perception of and adequate sense of the social context. The learner must have the ability to repeat the modeled task (through motor repetition, psychological, or emotional reproduction). Modeling could be expressed in performance on an exam, note taking, or by using learning in larger knowledge construction. The final step in the modeling process requires some form of motivation for the learner to behave differently; this could be direct external motivation or internal self-regulated motivation (Bandura, 1977).

Learning in Adults. One issue that both Vygotsky (1990) and Knowles (1990) agreed on was related to the theory of adult learning (andragogy). Both theorists asserted that there is a difference between how children and adults learn, and that the process to move from one side of the spectrum to the other is not punctuated by rapid advances (Vygotsky, 1993; Knowles, 1990).

Learning in adults is closely tied to motivation (Knowles, 1990). Learning is much more likely to occur in adults when there is a need (either social or environmental) which would lead to an advantageous outcome for the individual learner (Knowles, 1990). The shift from the use of pedagogy to andragogy should be a gradual one (Knowles, 1990) paralleling the social, emotional, and cultural maturation of the

individual. As children develop into adults, one should shift the method of teaching

across the spectrum to accommodate social development. Adult learning theory includes

a strong need for learners to be self-directed and to understand the benefit of the learning;

the latter of which is closely tied to motivation of the learner (Knowles, 1990). The idea

of social learning is also strongly emphasized when working with adult learners

(Knowles, 1990).

<div align="center">**Key Variables**</div>

In this study, the research examined several key variables. These variables include

student performance, attendance patterns, and VLC usage. As explained previously,

video viewing and usage was further subdivided for the purpose of this study, but in this

section will be considered as one category for review of extant literature.

Video Lecture Capture

Video lecture capture (VLC) is defined as the video, audio, and slideshow

recording of a lecture (Newton, Tucker, Dawson, & Currie, 2014). When VLC first

started to be used, it was often expensive and required more human effort, such as a

camera operator (Dickson, Adrion, & Hanson, 2008). Students have come to expect the

use of media and video in courses (Tsai, Shen, & Chiang, 2014). These recordings can be

of a few variations; recordings of slides with voice over, recordings of a lecturer without

supplemental visuals, or the picture in picture view of a slide and the instructor teaching

simultaneously, or in one case the VLC was created by both instructors and students

wearing glasses fitted with audio/video recording devices (Chen & Wu, 2015;

Myllymaki, Penttila, & Hakala, 2014; Odhabi & Nicks-McCaleb, 2011). Additionally,

some recent studies of student perception of topic difficulty show increases in student preference for the presence of video lecture resources (Aldamen, Al-Esmail & Hollindale, 2015; McCunn & Newton, 2015).

Drouin, Hile, Vartanian, and Webb (2013) suggested that students preferred VLC that incorporates multiple audio/visual components such as the video of the lecturer, slides, and audio. Video lecture capture can either be intended to be a supplemental study resource to give students time to review class based or instructor presented videos or it can be used as a substitute for classroom attendance for distance students (Akiyama et al., 2008; Bassili, 2008; Bennett & Glover, 2008; Brecht & Ogilby, 2008; Hahn, 2011). Danielson, Preast, and Hassall (2014) suggest that a higher percent of students feel VLC is effective than faculty. Given the increasing popularity of VLC, less than 10% of institutions globally have adopted comprehensive VLC systems (Newton et al., 2014). At least one institution is working to make all VLC recordings freely available as open educational resources (Llamas-Nistal & Mikic-Fonte, 2014).

In this study of archival data, the VLC recordings were available to students to view at their leisure. This method of recording is the preferred method of VLC and lecture viewing by students (Cooke, Watson, Blacklock, Mansah, Howard, Johnston, & Murfield, 2012; Hahn, 2012; Owston, Lupshenyuk, & Wideman, 2011). This method of VLC is accomplished through the use of one of several major software tools designed for this purpose. Some software packages for creating VLC currently include Accordant, Unvine, Tegrity, and Echo 360 (Fang & Pursel, n.d; Wientijes, 2007). Several other commercial products could also be adapted to VLC use as well, including Blackboard

Collaborate. VLC does not always require advanced software. Some studies described more basic processes involving personal digital cameras or webcams (Davis, Connolly, & Linfield, 2009; Newton et al., 2014).

Video Usage

According to Abdous and He (2011), the increased use of data mining techniques in higher education institutions better allowed these institutions to sift through large amounts of data and better identify patterns in student learning that were previously not detectable. This change has been facilitated mainly through the increased use of learning management systems (LMSs) and the subsequent generation of large quantities of unstructured data. Even with this increased access to student learning data, information about frequency and duration of student VLC viewing patterns are still somewhat unclear in the extant VLC research (Fang & Pursel, n.d.).

Fang and Pursel (n.d.) examined 31 studies that looked at VLC use in various settings. In these studies, video usage typically fell into one or more of these categories: frequency of video viewing, time spent viewing videos, quantity of videos viewed, and motivation for viewing videos. These variables were examined either through the use of in class surveys or mining data from learning management systems or other log files.

Researchers have examined how students interact with VLC using different foci and methodologies and have found different results (Fang & Pursel, n.d.). Fakhry and Dehkordi-Vakil (2007) examined the use of videos as a supplement to other activities; in this case as an instructional tool for dental students while working in the clinical lab. The process that many researchers have used to collect video usage data is to examine

analytics collected by learning management systems (Fang & Pursel, n.d.; Marchand, Pearson, & Albon, 2014). Instructor recorded videos could be viewed as students were working within lab activities (2007). Leadbeater, Shuttleworth, Couperthwaite, and Nightingale (2012) suggested most students in their study (~75%) used the videos to review material, but only about 5% downloaded and viewed every video. McNulty et al. (2009) reported wide disparity in student use of VLC among first and second year medical students; 60% of students watched less than 10% of the available videos.

Toppin (2011) reported that students surveyed in his study showed wide variation in their responses to survey questions about number of videos viewed as well as time spent viewing each video. Toppin (2011) did not indicate the total number of videos available to each student but reports responses between 28% to 34% for three of the four possible options (total number of videos viewed: 1-2 videos, 3-4 videos, or 5+ videos). When asked how long each student spent on average on each video, responses varied from 12 to 25% over five response options. This lack of variation supported the assertion by Fang and Pursel (n.d.) that the majority of studies they examined indicate that students are more likely to watch specific sections than to view a whole video.

Researchers have examined the conditions of video viewing as well. Akiyama, Teramoto, and Kozono (2008) examined how and when students were viewing VLC. The authors reported that 60% of video viewing occurred between 6pm and 2am. This trend is consistent given the perceived study patterns of college students. But Akiyama et al. (2008) also indicate that the use of VLC gave students the ability to watch lectures at not just more convenient times but also in more convenient locations than a lecture hall on a

campus. Bennett and Glover (2008) found that more than 90% of the students they surveyed perceived VLC as assisting their learning. In addition many studies cite the ability to watch and re-watch specific videos or sections as a function that is highly approved of by students (Fang & Pursel, n.d.).

The amount of video viewing of students varied considerably between studies. Bollmeir, Wenger, and Forinash (2010) indicated that on average students accessed 3.4 out of the available 24 VLC lectures, and Larkin (2010) reported that more than 55% of students never accessed the VLC resources. These results contrast with studies such as Al Nashash and Gunn (2013) which reported that 92% of students in the class indicated the videos were easy to use. Since Al Nashash and Gunn reported that 92% of students in the class responded in the affirmative, one surmises that a high percentage of the class tried to use the resource. Whitley-Grassi and Baizer (2010) suggest that VLC was used by the majority of students in the class.

One variable of student VLC use that was of note in my study, as well as many others, is the relationship between VLC usage and attendance. The majority of researchers indicated that attendance was not negatively impacted by VLC use (Fang & Pursel, n.d). However, few of those studies took attendance, video usage, and performance into consideration as a combination of variables. Williams, Birch, and Hancock (2012) indicated that they found a relationship between VLC viewing and attendance. In their study, they suggest that in general, students who are not attending face-to-face lectures are viewing videos. Either approach includes threats to the reliability and validity of the attendance data.

Student Attendance

In my study, the independent variable attendance was the self-reported attendance of the participants. Attendance data were collected via a survey asking students to rank into categories (none, <25%, 25-50%, 50-75% or >75%) the percentage of classes they attended. Ideally, studies using attendance as an independent variable would compare actual collected data on student attendance. The issue that seemed to arise across the literature is that those data only seem to be available in small classrooms where taking attendance was more practical.

Attendance was a concern in many studies examining courses that use hybrid, blended, or any web enhancement technologies such as lecture capture (Bollmeir et al., 2008; Grabe & Christopherson, 2007; Yudoko, Hirokawa, & Chi, 2008). Yudko et al. (2008) indicated that even though students held the belief that attendance would be impacted in the hybrid model, those same students did not present this effect in self-reported surveys.

Larkin (2010) examined student attendance patterns after the addition of VLC to the classroom. Data were collected in this study using a pre-test / post-test self-administered survey that focused on attendance preference. Larkin (2010) found most students preferred the face-to-face class to viewing online VLC. This preference is attributed to the two-way interaction that is possible with faculty in a face-to-face environment. This study represented another example of a smaller classroom environment where faculty interaction was more easily employed.

Grabe and Christopherson (2007) examined attendance and student use of online

course materials including lecture outlines and notes in two psychology courses with a

combined N=329. They collected attendance data based on six in-class events that were

felt to be representative of student attendance for the term. This study compared only the

extremes in the group, the upper 37% of attendees and the lower 28% of attendees. The

authors reported significant differences in performance between the two groups. This

suggested a negative impact on students with the worst attendance patterns. Drouin

(2013) documented a significant difference in attendance between two sections. One of

those sections, who had access to VLC, was such a case, but if the non-participating

students are removed the difference disappears. These findings seem to support the

conclusion that for the middle to high performing students: VLC is either beneficial or at

least not harmful. Newton, Wong, and Brady (2013) reported that absenteeism was only

associated with a 52% likelihood that a student will access the VLC for the lecture that

they missed.

The results of studies varied widely depending on the methodology. Larkin (2010)

indicated that many staff of educational institutions felt that the use of VLC would have a

negative impact on attendance. Bassili (2008) suggested that students who primarily

viewed videos online are those that were not truly interested in learning or engaging with

their peers or instructors. That said, studies like the ones conducted by Aldamen, Al-

Esmail, and Hollindale (2015) and Bollmeir et al. (2010) did not find an attendance

difference with the introduction of VLC. In my study the VLC was introduced after an in-

class break and attendance was taken as an aggregate. A meta-analysis of current research

and future directions in the study of lecture capture (VLC) conducted by Fang and Pursel (n.d.) examined 26 articles found that in studies that used both surveys and actual attendance collected in class there was no influence or no negative influence on attendance from the use of VLC.

Groen, Quigley, and Herry (2016) examined attendance as a self-reported value. Results on their study suggested that decreased attendance of some students yielded an increase in video viewing to acquire the missed material. Self-reported survey responses suggested that the students perceived that the recorded lectures increased student performance.

Wiese and Newton (2013) found that the use of VLC resulted in an increase in performance on the final exam of 5%. In addition, they suggested that the likelihood of VLC impacting attendance was more closely tied to the students' learning approach. Students who favored the deep learning approach had lower absenteeism, while those following the deep surface approach had more absences.

This finding was echoed in the study by Al Nashash and Gunn (2013) which found that according to surveys of students, availability of VLC did not encourage students to skip class; though there may be a difference in effect on attendance when considering courses where attendance is required or expected versus those courses with no expectation of attendance due to the VLC technology.

Student Performance

Student performance was often a focus of research on VLC since student success is at the heart of the educational concerns for teachers and administrators. Student

performance in most cases was correlated to grades in the course (Bassili, 2009;

Bollmeir, Wenger, & Forinash, 2010; Grabe & Christopherson, 2007; Owston et al.,

2011). These grades are typically one of or a combination of: final course performance,

individual or multiple exam scores, prior grade point average or self-reported quality or

improvement.

Bollmeir et al. (2010) examined student performance based on final course grades

in a course that provided 72 hours of video recorded lectures for students to view. The

authors compared final course grades to the total number of accesses (click counts) to the

video. The researchers used the final grades to compare with final exam scores as well as

with performance with the course in the previous year. Bollmeir et al. (2009) reported no

correlation was found between final grade and VLC videos viewed. Pale, Paetrovic, and

Jeren (2013) also reported no significant difference in student performance. Similar

results were also found in a study looking at the use of audio only podcasts as a lecture

replacement (O'Bannon, Lubke, Beard, & Brit, 2011).

Calk, Alt, Mills, and Oliver (2007) describe some effective uses of VLC. They

grouped students by performance groups based on grade point average (GPA) but only as

a way to frame the students' responses on a survey instrument. Overall individual or class

grades were not examined in this study; rather scores from multiple quizzes were used.

The researchers found that the delivery method (video of a paid actor delivering faculty

developed content or a live faculty led class) did not affect quiz scores.

For the indicator of course performance, Grabe and Christopherson (2007) used

individual exam grades as indicators of the students' performance. Student performance

in this study was used to frame the use of online resources including lecture notes and audio recordings as a method of studying for an exam. The authors examined course performance by looking at performance individually on three exams. They concluded that attendance only has a deleterious effect on performance on exams if there was not an increased use of online materials.

Owston et al. (2011) in their study of VLC, used the terms student grades, achievement, and performance interchangeably. Grades were translated to a ten point scale and means were used to group students. They concluded that VLC was more beneficial to low achieving students than to high achieving students. This was based on surveys of student perceptions of VLC. One limitation of this study was that only 19% of their total respondents were included in the performance indicators as that is the portion of respondents that elected to give student IDs to allow for grade matching in the study (Owston et al., 2011).

Roberts (2015) used the overall course grade as an indicator of performance. In this study, the researcher compared face-to-face and online with lecture capture course sections. Attempts were made to control for selection by factoring in prior GPA into the determination of course performance. One of Roberts' notable findings was that the differences in performance between sections disappears when only the high performing students were considered. This population likely mirrors the population in my study where all students come from pre-pharmacy, pre-medicine, and other professional programs.

Rogers and Cordell (2011) and Marchand, Pearson, and Albon (2014) both reported that based on student responses to surveys, the VLC had a positive impact on performance. Both of these studies relied on self-disclosure of grades on a survey. These data were self-reported and generalized to the sample. Results indicated that the students surveyed in this study perceived an increase in course performance for having used VLC. Sloan and Lewis (2014) concluded that VLC was associated with higher exam scores and, therefore, should be more heavily promoted by faculty.

Yu, Wang, and Sut (2015) examined the impact of visual arrangement of content on student performance. The researchers suggest that there is a positive correlation between visual placement of content and student performance. One surprising characteristic of this study is that the population was 95% female.

While examining the impact of VLC on non-native English speakers, Shaw and Molnar (2001) used several individual exams as well as overall course grades in sections of the same course to measure performance. One section used VLC and one did not. Individual exams yielded variable relationships between native and non-native English speakers in the two sections. There was a marked benefit to having access to VLC for non-native English speakers over English speaking students based on the researchers' measurement of effectiveness. The Shaw and Molnar study is interesting because it was not completely clear if there was an overall benefit to the use of VLC because students were only grouped as native and non-native English speakers.

Student performance indicators were quite varied in the literature. Stroup, Pickard and Kahler (2012) used prior GPA as an indicator of performance. The authors noted that

prior GPA was a strong indicator of course performance, but in their study the difference between the VLC sections and those without VLC was not significant in overall course performance. Bosshardt and Chiang (2016) examined a face-to-face section as well as a lecture capture section. They reported no significant difference in course performance between the two course sections.

Prober and Heath (2012) also compared the performance between groups where one group viewed VLC videos and the other group was lectured to by a Noble Prize winning physicist. The VLC group out-performed the lecture group according to Prober and Heath (2012) but the VLC group also spent most of the class time completing real world and hands-on problems and engaging in high-level discussions, which may have influenced performance.

Summary and Conclusion

Researchers have examined the key variables of student performance, attendance patterns, and VLC video usage. Fang and Pursel (n.d.) in their meta-analysis of VLC studies note that there is some variation in how each of these variables is conceptualized and examined. In my study, I examined these variables in a unique way and with a larger sample size than many other studies described in the literature. The methods of data collection that were used to collect these archival data, as well as the methods that I used to analyze this archive contribute a new perspective to the literature. In the next chapter, I describe in detail the research method for my study.

Chapter 3: Research Method

As stated in Chapter 1, the goal of this research was to gain a better understanding of how students in large, face-to-face courses used VLC technology, and to identify patterns of use of this technology in their classes (see Tables 1 and 2). I used archival data collected and mined at a large research university. In this chapter, I describe the research design and rationale. As this was a study of archival data, I describe the population, sampling procedures, and methods for the archive construction as provided by the institution where the data were collected.

Research Design and Rationale

In this study, my intent was to compare the variables *frequency of VLC viewing* (IV_1), *quantity of VLC viewing* (IV_2), and *student attendance* (IV_3) with *course performance* (DV) using quantitative analyses to investigate interactions among these variables (see Table 3). This allowed me to examine multiple ways to use VLC and its impact on course performance. I chose to use two-way ANOVA because it allows for the examination of the effects of multiple independent variables. Regression methods were examined and ruled out because the independent variables are not necessarily predictive as is required in regression analysis.

Research Questions and Hypotheses

Research Question 1: Are there differences in course performance (DV) based on frequency of video lecture viewing (IV_1)?

- (Frequency of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on frequency of VLC video viewing.

H_1: There will be significant difference in course performance based on frequency of VLC video viewing.

Research Question 2: Are there differences in course performance (DV) based on the quantity of video lectures viewed (IV_2)?

- (Quantity of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on the quantity of VLC videos viewed.

H_1: There will be significant difference in course performance based on the quantity of VLC videos viewed.

Research Question 3: Are there differences in course performance (DV) based on student attendance (IV_3)?

- (Student Attendance Main Effect)

H_0: There will be no significant difference in course performance based on attendance patterns.

H_1: There will be significant difference in course performance based on attendance patterns.

Research Question 4: Does course performance vary as a function of the frequency of VLC viewing (IV_1) and attendance (IV_3)?

- (Frequency of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

H_1: There will be significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

Research Question 5: Does course performance vary as a function of the quantity of video lectures viewed (IV_2) and attendance (IV_3)?

- (Quantity of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

H_1: There will be significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

Study Variables

The *frequency of VLC viewing* (IV_1) was defined as the frequency with which a student viewed videos throughout the study period. Frequency was measured as the number of days per week that a student viewed one or more videos. Students' frequency was taken as the average number of days per week they viewed video recordings.

The *quantity of VLC videos viewed* (IV_2) was defined as the mean of the number of different recordings viewed throughout the study period as compared to the rest of the

study population. The third independent variable, class *attendance* (IV$_3$), was determined

by examining an archival poll of the class where students voluntarily characterized their

attendance patterns into one of five levels: (a) attended more than 75% of class sessions,

(b) attended 50%-75% of class sessions, (c) attended 25%-50% of class sessions, (d)

attended less than 25% of class sessions, or (e) attended none of the class sessions.

Table 4

*Research Questions and Effect*s

Research Questions	Effects
Are there differences in course performance (DV) based on frequency of video lecture viewing (IV$_1$)?	Frequency of video viewing main effect
Are there differences in course performance (DV) based on the quantity of video lectures viewed (IV$_2$)?	Quantity of video viewing main effect
Are there differences in course performance (DV) based on student attendance (IV$_3$)?	Student attendance main effect
Does course performance vary as a function of the frequency of VLC viewing (IV$_1$) and attendance (IV$_3$)?	Frequency of video lecture viewing X student attendance interaction effect
Does course performance vary as a function of the quantity of video lectures viewed (IV$_2$) and attendance (IV$_3$)?	Quantity of video lecture viewing X student attendance interaction effect

Methodology

This was a quantitative study in which I examined secondary archival data

collected at a large research university to explore patterns of student use of VLC in order

to determine if interactions exist between student attendance, patterns of use, and student

performance. The de-identified archival data consisted of student course grades, when

and how many times each video lecture was accessed by each student, and responses to a voluntary survey completed by the students regarding their attendance. The data from the archived survey of students also consisted of 10 to 15 closed-ended questions. For this study, my primary interest in the survey was in the self-reported student attendance data.

These archival data were generated and compiled by a learning management system. These data were assigned to one of the randomly generated ID numbers for each student, which allowed me to match score data with survey data without identifying individual students. Attendance data were taken from surveys, and frequency and quantity of video views data were taken from student usage analytics from the learning management system. Responses in this archive were recorded during the spring 2010 semester.

These archival data were collected by the university personnel using a modified version of the instrument used in the Whitley-Grassi and Baizer (2010) study at the same institution. The data in the archive provided by the university were previously unanalyzed data from a different sample pool than that in the Whitley-Grassi and Baizer (2010) study. The variables for my study are listed in Table 3.

I employed SPSS software and used a two-way ANOVA to determine if there was a main effect of each independent variable on the dependent variable as described in Table 4. I also examined the interactions between the independent variables. The two-way ANOVA allowed me to examine the following: (a) the differences in course performance based on frequency of video viewing, (b) whether there was a difference in course performance based on quantity of videos viewed, and (c) whether there was a

difference in course performance based on attendance. This statistical test also allowed me to consider the interaction that the frequency of video viewing had on student attendance as well as how course performance may vary as a function of the quantity of video lectures viewed and attendance. I examined standardized scores (averages) of the final course grades as an indicator of student performance (DV).

Population

I examined archival records of student scores, VLC usage, and surveys of 311 undergraduate students enrolled in a two-semester intensive human physiology course in 2009-10 at a large research institution. Students enrolled in this course primarily intended to continue to a doctoral program in pharmacy or another advanced health sciences field, which require a two-semester intensive human physiology course. Most of the students were probably college seniors.

Sampling and Sampling Procedure

The participants whose survey-response data were collected for this archive were selected because of ease of access (see Whitley-Grassi & Baizer, 2010). Thus, this sample was a convenience sample. Data were collected via a voluntary survey, with consent incentivized by one point of extra credit. The methodology also allowed participants to opt out and still receive one point of extra credit as a control for bias and to reduce the likelihood of coercion. Course instructors in this team-taught course were never told which students participated (see Whitley-Grassi & Baizer, 2010). Archival data include records from approximately October 2009 through April 2010. G-Power (Faul, Erdfelder, Lang, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009)

indicated that a target sample size of 300 responses was needed for a designated power of .95, and effect size $f = 0.29$ (critical $F = 1.86$).

Procedures

This archival data was made available by my study site. It contained data collected in January 2010 and April 2010 by staff in the Physiology and Biophysics department. This archive represents a convenience sample given that those students enrolled in the selected courses were invited to participate in the project by the researchers.

Archival Data Use

These data were collected in a large undergraduate course at a large research university. Participants were recruited by means of announcements via email and within the learning management system (see Whitley-Grassi & Baizer, 2010). An informed consent statement was delivered electronically with the survey. Due to the sensitive nature of the data (student grades and attendance patterns) and the potential of perceived threat to the students, their participation was voluntary. The survey itself was conducted online. The department chair and the individual course coordinators granted access to the students within this population for the pilot study.

I made a request to the department and Co-PI of the pilot study to use the de-identified data set for this dissertation research. Both the department chair and the Co-PI approved its use. Upon acquiring Walden IRB approval (05-03-16-0063825), I was granted access to the data set.

Instrumentation

Data for this archive were collected by Whitley-Grassi and Baizer using the instrument included in Appendix C, but a portion of the archive used in this study is not the same data previously published. Student participation was completely voluntary. Respondents to the survey were found to have similar grade distributions to the class as a whole; that is, the distribution of letter grades of respondents is similar to overall class grade distributions, indicating that the data were a representative sample. Though all students' performance was tracked, those students not participating in the survey were not included in the analysis. Course grades for participating students were collected in a way that prevented course instructors and administrators from individually identifying students. These data were then coded and de-identified to create the archival data set for this study.

Threats to Validity

According to Whitley-Grassi and Baizer (2010), the sample used to compile this archive was largely representative of the student population. "The average participating students ages were largely between 19 and 25 years old, participant sex ratios were 1:1 (approximately 50% male and 50% female), and the students' ethnic background were similar to the university community as a whole" (Whitley-Grassi & Baizer, 2010, p. 33). As such, this research should be generalizable across students in large lecture classes in large research universities. According to the professor of the course, about 70% of the enrolled students completed the survey and consented to the study for the period on which this research will be based. There is a chance of selection bias in that high

achieving students may be more likely to participate in the study, attend class more, or view more videos. Whitley-Grassi and Baizer (2010) note that the sample was representative of the enrolled students by grade distribution.

The archival data were collected by offering participating students a small incentive. According to the Professor of the course, the incentive increased response rates dramatically over the Whitley-Grassi and Baizer (2010) study. Before data analysis, an examination of the 2010 samples was completed to ensure that these responses are still representative of the population.

As this archive includes volunteered responses to questions about class attendance, there is some risk of threat to validity in that the researcher assumes that respondents were truthful in their responses. Whitley-Grassi and Baizer (2010) indicated the responses about attendance varied widely which supported the assumption that respondents were truthful.

Ethical Procedures

Letters from the Co-PI of the pilot study as well as the department chair responsible for the course were included in IRB application documents. As the archive was de-identified, there was complete anonymity for participants in this study. No additional data collection was conducted and no participants were contacted. Data included in the archive are comprised of data that is six to seven years old and are likely responses of students no longer enrolled at the university.

The original data collection used to create this archive was approved by the University at Buffalo Social and Behavioral Sciences Institutional Review Board for

Proposal 3666. As noted previously, the archival data that were used in this study have been de-identified. Data will be destroyed in compliance with the University at Buffalo Social and Behavioral Sciences Institutional Review Board approval, within five years of completion of data analysis.

I was involved in the collection of these data as part of my responsibilities while employed at my study site. I no longer have access to confidential records of materials that could be used to identify respondents in this study. Further, I was only provided with the necessary materials to complete this study under the approval of the Walden University Institutional Review Board.

Summary

In this study, I examined an archival data set of student responses to a survey about attendance patterns and the corresponding patterns of use of VLC resources as reported by the learning management system. Data collection for this archive was conducted using similar methodology as Whitley-Grassi and Baizer (2010), but the archive contained data that were not previously analyzed nor included in prior published work.

This study employed a two-way ANOVA to examine the main and interaction effects between variables (frequency of VLC viewing (IV_1) and quantity of VLC viewing (IV_2) and student attendance (IV_3) with course performance (DV). Attempts were made to limit threats to internal external validity by closely examining the archival data when it was made available, for representative and consistent responses. Respondent's anonymity was maintained through using de-identified data, as well as examining data from students

who would likely be separated from the institution due to elapsed time since collection (6 to 7 years ago). All appropriate materials available from the pilot study, including University at Buffalo Social and Behavioral Sciences Institutional Review Board materials and permission letters from the course instructor and department chair, were provided to the Walden IRB for consideration. In Chapter 4, I share the details of the analyses and findings of my study.

Chapter 4: Results

The purpose of this research was to gain a better understanding of how students use streaming VLC in large undergraduate lecture courses, and of the effect of attendance on course performance (see Tables 1 and 2). Using a quantitative approach, I drew from archival data mined at a major research university. With the intent to determine the effect of variables *frequency of video viewing, quantity of video viewing*, and *student attendance* on course performance, I used statistical analyses to investigate interactions among these variables. Ultimately, I sought to determine which pattern or patterns of VLC use best supported student performance, as indicated by final course grade, and to examine the effects these variables had on each other in the larger lecture hall teaching model. It is my hope that the findings will help faculty and administrators at institutions of higher education to better use VLC and similar technologies to improve and support student learning.

Pilot Study

A pilot study was conducted by Whitley-Grassi and Baizer (2010). This research was based on that pilot study in which the researchers found that student usage of VLC was positively correlated to course performance and attendance patterns in a large lecture class ($N = 128$) when assessed using a similar survey to the one used in this study. Whitley-Grassi and Baizer (2010) employed a Mann-Whitney ranked order test, and concluded that students who primarily attended class to acquire the information and also used VLC as a supplement performed significantly better in the course than those students who used the VLC as their primary mode of acquiring lecture material ($p =$

0.048). The 2010 results also showed a positive correlation between student attendance and VLC use with overall course performance.

Data Collection

The data sets were extracted from archival data provided by a large research university in the northeastern United States. These data were originally collected from undergraduate/graduate level Human Physiology courses in Spring 2010. According to the professor of the course, the majority of students in this course were accepted to, or had applied to, the Pharmacy doctoral program, or were enrolled in similar graduate programs such as physiology, kinesiology, or other medical sciences program. The archived data collection was supervised by department faculty and administrators and approved by the IRB of that institution.

The archival sample included over 300 participants' survey responses, video usage data, and course grades (N = 311). This archival data also included the number of videos viewed and number of times that each video recorded lecture was viewed by each student. The identifying student information was removed prior to the release of the archive to maintain student anonymity for this dissertation research. For this study, all complete records from the archival sample were included. Complete records include usage reports from the learning management system, survey completion, and final score (normalized from the course grade) in the course. Students who did not complete the survey or did not receive a final grade in the course were not included in the sample.

Students in the sample have a similar demographic breakdown to those of the university as a whole. The distribution of female to male students was 55% female to

45% male in the study population, this is compared to 54% male and 46% female for the

university population as a whole as reported in the 2014 academic year (see Figure 1).

The age of students in the archive is shown in Figure 2. The university reported that 7%

of its student body was over the age of 25. The archive data indicated that 7% of the

sample students were age 27 or older. The ages of the students in this study were also

consistent with those data reported by the institution. These data support the external

validity of the sampled population.
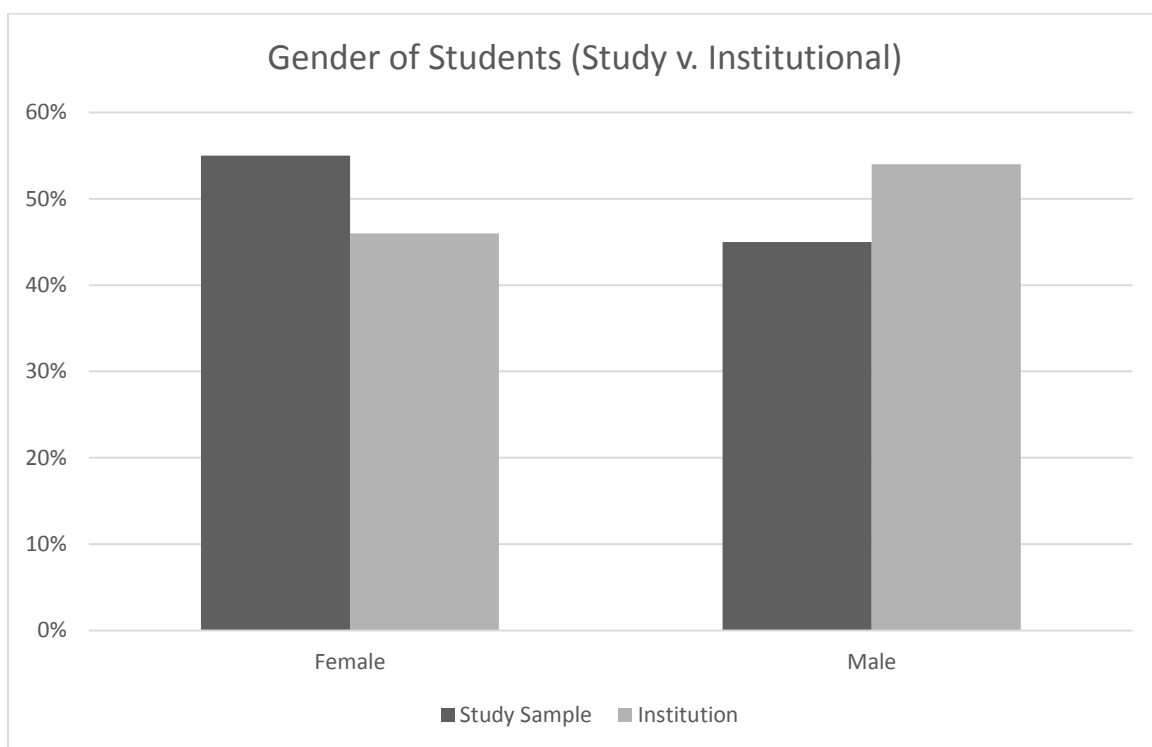
Figure 1. Participant gender demographics.
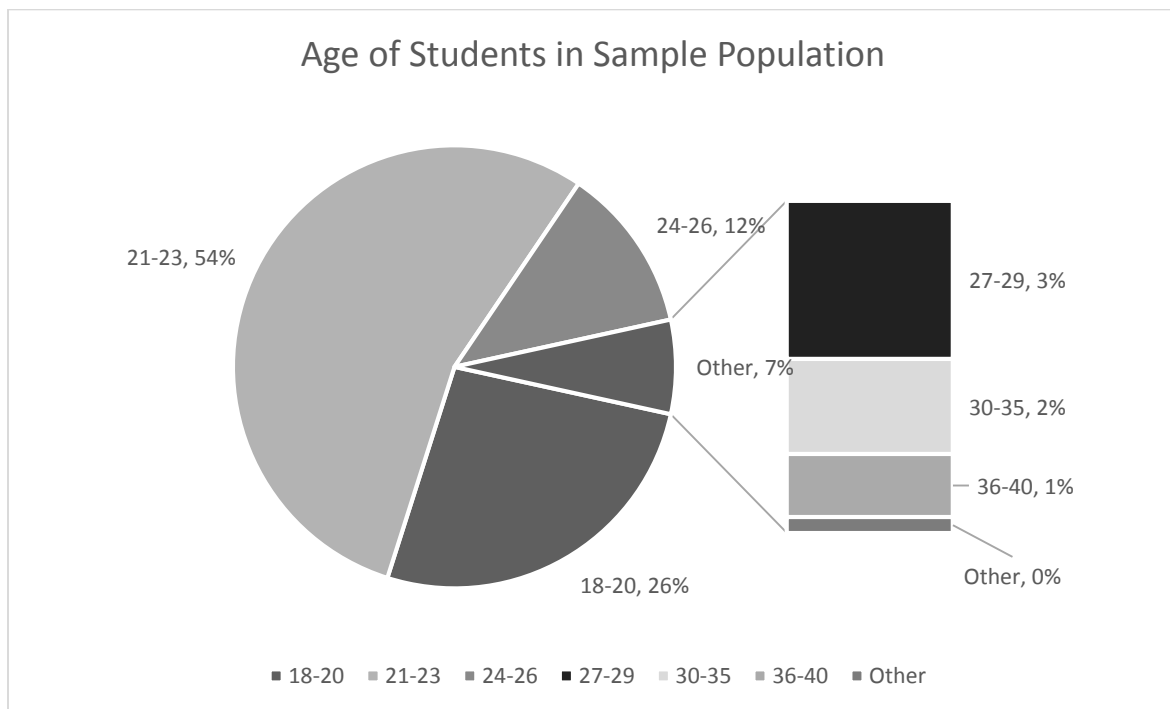
Figure 2. Participant age demographics.

Students were asked to characterize their attendance patter for this class by ranking themselves into one of five categories (see Figure 1). The most frequently chosen classification, at 34% of respondents, indicated that they attended less than 25% of class meetings. The other four categories (see Figure 3) were between 11% and 21% of respondents. This distribution of varying of attendance patterns gives a reasonable sample population in each attendance pattern.
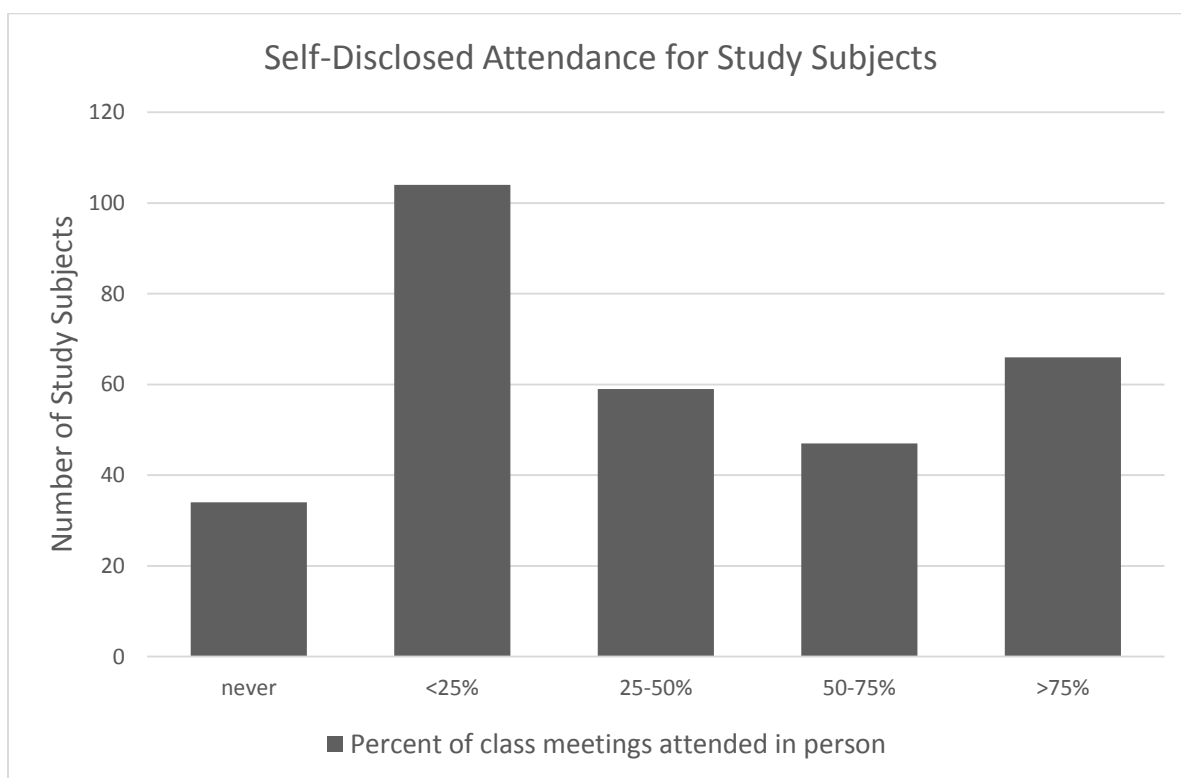
Figure 3. Self-disclosed attendance for study subjects.

Descriptive statistics of the sample variables are shown in Figure 5. Attendance was scored 1 to 5, as shown in Figure 1. The mean and median for the class was 3. This equated to 25%-50% of the class meetings attended in person. Performance was measured according to the class score out of 150 possible points. Scores ranged from 47 to 146. According to the professor of this course, it was a strongly "B" centered course where a B is represented by scores between 107 and 118. The mean and median both fall within that range. Quantity of videos viewed was scored 1 to 4 based on quartiles as shown in Figure 1. Frequency is presented as the average number of days a week that videos were viewed. The days per week videos were viewed ranged from 0 to 3.73. The mean was just over 1 day per week.

Table 5

Variable Descriptive Statistics

	Attendance	Performance	Quantity	Frequency
Mean	3.02	110.14	2.54	1.10
Standard Error	0.08	1.04	0.05	0.04
Median	3.00	112.00	2.64	1.07
Mode	2.00	121.00	1.00	0.73
Standard Deviation	1.34	18.39	0.90	0.71
Sample Variance	1.78	338.21	0.82	0.50
Kurtosis	-1.23	0.20	-1.16	0.53
Skewness	0.22	-0.64	-0.15	0.79
Range	4.00	99.00	3.00	3.73
Minimum	1.00	47.00	1.00	0.00
Maximum	5.00	146.00	4.00	3.73
Sum	937.00	34255.00	789.72	342.20
Count	311.00	311.00	311.00	311.00
Confidence Level (95.0%)	0.15	2.05	0.10	0.08

Results

To conduct the statistical analyses for this study, I employed SPSS software and preformed two-way ANOVA analyses to determine if there was a main effect for each independent variable on the dependent variable as shown in Table 5. I also examined the interaction between the independent variables. The two-way ANOVA allowed me to examine the research questions and hypotheses as described below.

Table 6

Three-Way ANOVA for Attendance, Quantity of Videos Viewed, and Frequency of Video

Viewing

Source	SS	df	Mean Square	F	p
Attendance	1829.160	4	457.290	1.344	.254
Quantity of Videos Viewed	1127.857	3	375.952	1.105	.348
Frequency of Video Viewing	3081.289	3	1027.096	3.018	.030*
Attend * Quantity of Videos Viewed	3669.490	12	305.791	.899	.549
Attend * Frequency of Video Viewing	3902.381	10	390.238	1.147	.328
Quantity of Videos Viewed * Frequency of Video Viewing	938.192	4	234.548	.689	.600
Attend * Quantity of Videos Viewed * Frequency of Video Viewing	506.122	6	84.354	.248	.960

Note. R-Squared = .133 (Adjusted R-Squared = -.004)

Analysis of Research Questions and Hypotheses

Research Question 1: Are there differences in course performance (DV) based on frequency of video lecture viewing (IV$_1$)?

- (Frequency of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on frequency of VLC video viewing.

H_1: There will be significant difference in course performance based on frequency of VLC video viewing.

There were significant differences in course performance based on the frequency of video viewing. The two-way ANOVA showed a statistically significant main effect for frequency of video viewing, $F = 3.018$, $p = .030$ (see Table 6). In this case, I accepted the alternative hypothesis.

Research Question 2: Are there differences in course performance (DV) based on the quantity of video lectures viewed (IV_2)?

- (Quantity of video viewing Main Effect)

H_0: There will be no significant difference in course performance based on the quantity of VLC videos viewed.

H_1: There will be significant difference in course performance based on the quantity of VLC videos viewed.

There were no significant differences in course performance based on the quantity of videos viewed. The two-way ANOVA did not result in a statistically significant main effect for quantity of videos viewed, $F=1.105$, $p=.348$ (see Table 6). In this case, I accepted the null hypothesis.

Research Question 3: Are there differences in course performance (DV) based on student attendance (IV_3)?

- (Student Attendance Main Effect)

H_0: There will be no significant difference in course performance based on attendance patterns.

H_1: There will be significant difference in course performance based on attendance patterns.

There were no significant differences in course performance based on the attendance patterns. The two-way ANOVA did not result in a statistically significant main effect for quantity of videos viewed, $F = 1.344$, $p = .254$ (see Table 6). In this case I must accept the null hypothesis.

Research Question 4: Does course performance vary as a function of the frequency of VLC viewing (IV_1) and attendance (IV_3)?

- (Frequency of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

H_1: There will be significant difference in course performance due to the interaction of the frequency of VLC video viewing and attendance.

There were no significant differences in course performance due to the interaction of the frequency of VLC video viewing and attendance. The two-way ANOVA did not show a statistically significant interaction effect for course performance due to the interaction of the frequency of VLC video viewing and attendance, $F = 1.147$, $p = .382$ (see Table 6). In this case I must accept the null hypothesis.

Research Question 5: Does course performance vary as a function of the quantity of video lectures viewed (IV_2) and attendance (IV_3)?

- (Quantity of video lecture viewing X Student Attendance Interaction Effect)

H_0: There will be no significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

H_1: There will be significant difference in course performance due to the interaction of the quantity of videos viewed and attendance.

There were no significant differences in course performance due to the interaction of the quantity of videos viewed and attendance. The two-way ANOVA did not show a statistically significant interaction effect for course performance due to the interaction of the quantity of videos viewed and attendance, $F = .899$, $p = .549$ (see Table 6). In this case, I must accept the null hypothesis.

Further, a three-way ANOVA was added to the data analysis and did not demonstrate a significant difference in course performance due to the interaction of quantity of videos viewed, frequency of videos viewed, and attendance ($F = .248$, $p = .960$), as shown in Table 6.

Estimated Marginal Means

In both Figure 4 and Figure 5, the vertical plot was the dependent variable course performance and the horizontal plot was for "quantity" in Figure 4 and "frequency" in Figure 5. The general shift upwards as the dependent variables increased may suggest an increase in performance as quantity and frequency of videos viewed also increases. In Figure 4, the lines are mostly parallel which is typical of those variables that do not have a significant interaction effect. In Figure 5, we see many of the graphed lines cross between Frequency three and four. Observed non-parallel lines are often suggestive of an

interaction effect. In this study, frequency was the only significant variable impacting

course performance (*F*=3.018, *p*=.030) (see Table 6). This is illustrated in Figure 5.
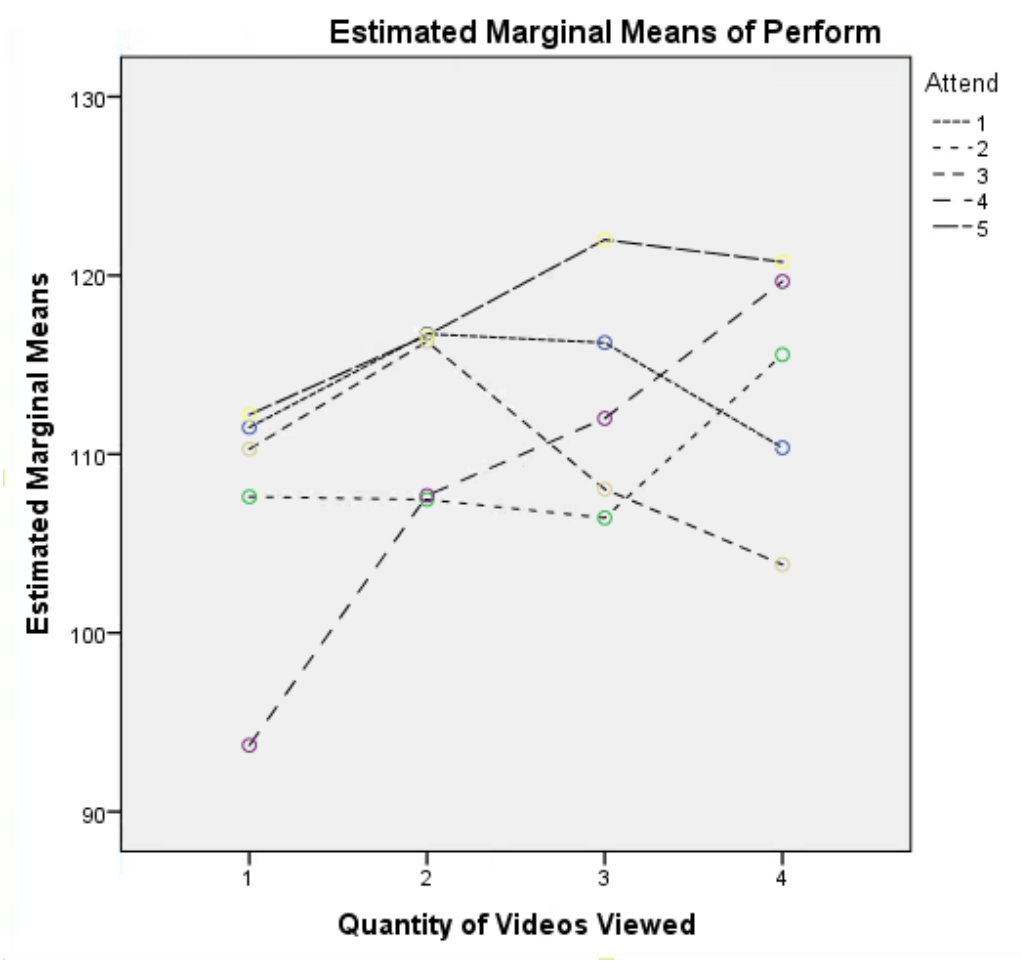
Figure 5. Estimated Marginal Means of Course Performance and Quantity of Videos
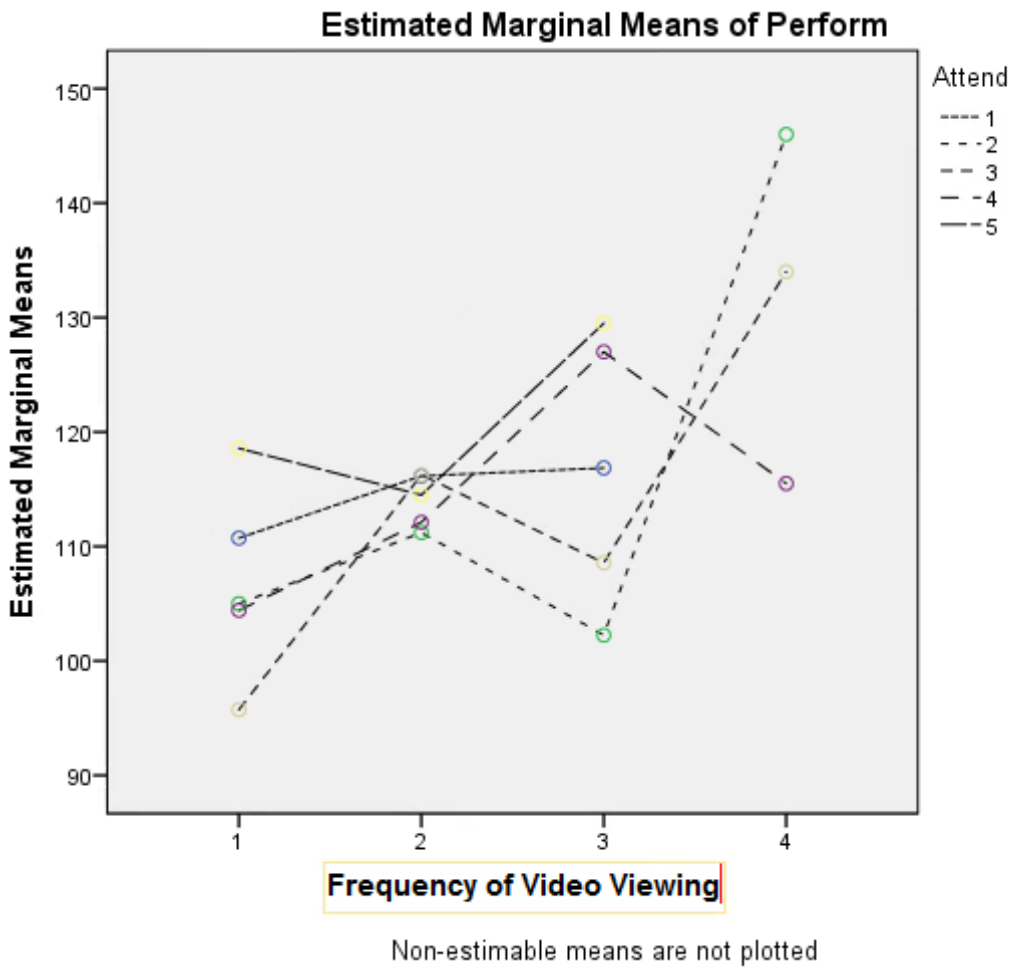
Viewed

Figure 6. Estimated Marginal Means of Course Performance and Frequency of Videos Viewed

Videos Not Viewed

During analysis, an additional variable was proposed, "number of videos not viewed". That is further defined as the number of video recordings available that were never viewed by the student. This additional independent variable was examined in a two-way ANOVA with course performance as the dependent variable as well as

examining the possibility of an interaction effect with attendance (see Table 7). The

videos not viewed main effect was statistically significant ($F=1.875$, $p=.016$).

Table 7

Two-Way Analysis of Variance for Attendance and # of Videos Unviewed

Source	SS	df	M	F	p
Videos Unviewed	11471.630	19	603.770	1.875	.016*
Attendance	692.187	4	173.047	.537	.708
Videos Unviewed * Attendance	10354.771	31	334.025	1.037	.418

a. R-Squared = .216 (Adjusted R-Squared = -.050)

Summary

The variables from my study that led to a significant difference in course

performance were the frequency of video viewing main effect ($F = 3.018$, $p = .030$; see

Table 6) and the number of unviewed videos main effect ($F = 1.875$, $p = .016$; see Table

7). The frequency effect is visually supported in Figure 6. Based on these findings,

increasing the frequency of video views over the term and not skipping videos both had a

positive impact on course performance. In Chapter 5, I share conclusions drawn from

these results.

Chapter 5: Conclusions

The purpose of this research was to gain a better understanding of how students use streaming VLC in large undergraduate lecture courses, and of the effect of class attendance and video use on course performance. The variables in my study that led to a significant difference in course performance were the frequency of video viewing ($F = 3.018$, $p = .030$) and the number of unviewed videos ($F = 1.875$, $p = .016$). This suggests that increasing the frequency of video views over the term, and watching more of the available videos had a positive impact on course performance.

Interpretation of the Findings

The increased use of data mining techniques in higher education institutions enables these institutions to sift better through large amounts of data and identify patterns in student learning that were previously not detectable (Abdous & He, 2011). This new opportunity has been facilitated mainly through the increased use of LMSs and the subsequent generation of large quantities of unstructured data. My study is an example of an investigation of a large, unstructured data set. The data in this study allowed me to examine student behavior based on data collected from an LMS. Even with the increased access to student learning data, information about frequency and duration of student VLC viewing patterns is still somewhat unclear in the extant VLC research.

Interpretation for Student Use

VLC can either be a supplemental study resource to give students time to review class-based or instructor-presented videos, or can be used as a substitute for classroom attendance for off-campus students (Akiyama et al., 2008; Bassili, 2008; Bennett &

Glover, 2008; Brecht & Ogilby, 2008; Hahn, 2011). My results that showed a significant

difference in course performance by frequency of video viewing ($F = 3.018$, $p=.030$)

support the hypothesis that the availability of the videos to review multiple times does

have a significant positive impact on course performance. My results also showed a

significant difference in course performance resultant from viewing more of the available

videos ($F = 1.875$, $p = .016$) and support the conclusion that students benefited by

viewing more of the available videos. Bennett and Glover (2008) found that more than

90% of the students they surveyed perceived VLC as assisting their learning; whereas

Danielson et al. (2014) suggested that a higher percent of students (compared to faculty)

feel VLC is effective. This appears accurate because in most cases students, rather than

faculty, would have a better understanding of how frequently students were viewing the

videos outside of class time.

Leadbeater et al. (2012) suggested most students in their study (~75%) used the

videos to review material, but only about 5% downloaded and viewed every video.

McNulty, et al. (2009) reported wide disparity in student use of VLC: 60% of students

watched less than 10% of the available videos. Bollmeir, Wenger, and Forinash (2010)

indicated that, on average, students accessed 3.4 out of the available 24 VLC lectures,

and Larkin (2010) reported that more than 55% of students never accessed VLC

resources. These results are far different from the subjects' VLC use in my study. Only

2.9% of subjects accessed less than half the available videos. Similar levels of use were

reported by Whitley-Grassi and Baizer (2010). Student use of VLC videos varies widely

across the literature. Causes are not fully understood, but could include support of faculty, ease of use, and perceived usefulness (Fang & Pursel, n.d.; Toppin, 2011)

Interpretation for Cognitivist Theoretical Framework

Vygotsky (1993) believed that acquiring new knowledge was an active process. VLC represents a type of learning that is typically more active than sitting in a classroom. Many studies cite the ability to watch and re-watch specific videos or sections as a function that is highly approved by students (Fang & Pursel, n.d.). VLC use requires more active participation and an increased level of attention to control the play and possible replay of content as compared to a more passive observational role like in a classroom. S-R theory, according to Knowles (1990), suggests that the role of the learner is active as opposed to passive. It seems reasonable, then, that as the frequency of VLC viewing increases, the student is more actively engaged, potentially leading to improved performance.

The Zone of Proximal Development (ZPD) is the performance gap between what a learner can do with help and without help (Vygotsky, 1978). This concept places importance on the social processes behind learning. According to Vygotsky (1978), the imitation of learning is a more social process that inherently involves variable levels of instruction from members of society with more experience. VLC gives unlimited access to the instruction from the experienced members of society (instructors). I found that increased frequency of viewing resulted in an increase in performance.

Interpretation for Andragogical Theoretical Framework

Some adults will most easily learn those ideas or concepts that they find

interesting or that are most relevant to their lives. Having a true interest in the topic the

learner is studying promotes learning, especially in adult students. Students in my study

were primarily between ages 19 and 25. This course is not an elective and is a

requirement for specific advanced graduate programs. This would imply some interest

and/or relevance in the content of the VLC videos for the subjects of this study given the

students' desires to make it through their program or to gain entrance to a professional

school.

Bandura (1977) and Knowles (1990) both suggested that the motivation of adult

learners is directly tied to their ability to learn. In this case, the motivation of the student

may affect the VLC usage choices of a student (frequency and/or quantity of videos

viewed), and my study showed that frequency of videos viewed does affect the students'

ability to learn and thus impacts their course performance. Further, the use of VLC is

more proactive learning than reactive. Reactive learning is usually accomplished by a

traditional classroom teacher delivering material lecture style (Knowles, 1990). Whereas

proactive learning requires an element of self-motivation and inquiry. Based on my

findings, VLC provides a platform for easy access to the material, but still requires the

proactive initiative to access the recorded lectures and view them in the students' free

time.

Limitations of the Study

The archival nature of the data was the greatest limitation in this study. As such,

the validity of this study may have been impacted by the quality of the original

researchers' data collection and processing techniques. Several questions arose during

analysis that could have served to clarify some of the observed results if additional questions could have been asked of the study participants. However, given the archival nature of the data, the questions asked of the original participants could not be modified. Since participants' information was de-identified, gaining additional information about participants beyond what was provided by the university was not possible. One such piece of data that could have been helpful is overall GPA.

There may be a reporting bias or error given the self-reported attendance data. Though these data appear consistent with observations from course instructors. The archived VLC usage data does not in itself contain bias. These data were generated electronically with no opportunity of biasing the collection of original data used to construct frequency or quantity of video lecture usage. The conceptualization of frequency and quantity could also be a limitation that may have impacted results, as these variables could have been conceptualized differently. Lastly, course performance was statistically calculated to limit the chance for bias.

In any study where surveys or interview methodologies are used, the possibility for deceit from participants is possible, but it must be assumed that the students in these courses were as truthful as possible with their self-report. In addition, positive elements of the methodologies, such as sample size and electronic automatic data collection, decreased researcher bias and reduced threats to validity.

Recommendations

There are often limitations with using archival data. From my experience and the analyses performed in this study, there are several additional approaches that I would

suggest for future studies. In Table 8, I categorize several recommendations for future studies.

Table 8

Recommendations for Future Study

Recommendation	Conceptualization	Benefits
Attendance	Capture real attendance data	Combats validity and limitations to the study.
"How" Students Use VLC	More accuracy than click count Viewing whole videos v. specific sections Distractions in the viewing environment Cramming behavior	Give a more complete picture of how students engage with VLC content.
Course Modality	Potential differences between online streaming only and face-to-face course	Would give the most accurate data on the impact of attendance if there was a group who did not attend.
Individual Student Variation	Consider comparing performance over various portions of the course.	Would give a matched sets comparison for changes in viewing behavior by the individual student.
Demographic Impacts	Age, Gender, Major	Identify if VLC is better suited to some demographic groups.
Instructor Variations	Differences in teaching style	Does teaching style impact VLC success or benefit?

Attendance

As previously noted, I relied on self-identified attendance in the form of the

percentage of classes students reported they attended over the course of the term. A study

using methodology to address actual attendance patterns would be beneficial. Studies that

have had actual attendance information tend to have a smaller sample size (Al Nashash &

Gunn, 2013). A study that could overcome the logistical issue of how to collect college

attendance in a large enough sample to make results more generalizable would benefit the

field.

"How" Students Use VLC

My study was the first that was discovered in the review of the literature that

takes a multiple variable approach to how students use VLC video content. In my study

the frequency of video viewing as well as the quantity of available videos viewed were

examined. I propose that to gain further understanding of the potential benefits and best

practices of VLC, several other variables could be examined. A student click was

considered a view in this study, but a study that could more accurately determine the

length of time a video was viewed, whether it was viewed in its entirety or only in some

smaller section, the timing of video viewing in relation to assessment, and possibly the

most difficult, the environment in which the student views the content to gauge levels of

distraction would provide much more insight to the effective practices for VLC usage.

Course Modality

Studies of VLC to this point, have mainly focused on courses with expected seat

time, either traditional face-to-face or some type of blended/hybrid course delivery

(Bollmeir et al., 2008; Grabe & Christopherson, 2007; Yudoko, Hirokawa, & Chi, 2008). In each of these modalities, students could, and likely did, flow back and forth between modalities. A study that could separate a randomly selected group into an "online" (zero seat time) group where students were expected to use VLC and compare it to a traditional or hybrid section where VLC is optional would be interesting as an attendance control group.

Individual Student Variation

It is possible that some students may change their VLC use patterns over the course of a semester. Another recommendation would be for a study to examine VLC use using individual units/exams as the indicator for course performance rather than the final course grade. This would allow the capture of changes in VLC usage by an individual over time and may provide a more compelling picture of VLC efficacy.

Demographic Impacts

This study did not examine the impact of gender or age on VLC use and course success. Student age could influence the motivations behind VLC use and, per Knowles (1990), the motivations that drive success and studying behavior could be different in different age groups of students. The same could potentially be true with gender and other demographic variables. Major or academic level could also be a variable that needs to be examined. In both this study and in Whitley-Grassi and Baizer (2010), students were drawn from a limited selection of pre-health/pre-medical academic disciplines. Further study to examine results consistent across a wider variety of professional preparation areas is suggested to increase the generalizability of these results.

Instructor Variations

A final recommendation for study would be to examine how instructor styles or methods impact the efficacy of VLC. If teaching style can impact performance in face-to-face course settings, then it would stand to reason that some methodologies or some dynamic instructors would be more effective in VLC formats.

Implications

The findings in this study demonstrate that both frequency of videos viewed and the numbers of unviewed video had an impact on course performance with the study population. Given that these results are not generalizable to the larger population, I would make recommendations for further study to students, faculty, and administrators on the use of VLC in educational settings. It is my hope that additional research, using a randomized control trial will allow recommendations that could inform the constituent groups and allow them to more effectively use VLC in teaching and learning at the college level and bring about positive social change.

Positive Social Change

The social problem that this research addressed was the use of VLC and its implications on student learning and course success. Admittedly, many academic institutions are interested in VLC as a solution to the problem of overcrowded course sections. VLC could represent near limitless potential for these sections to grow beyond seat capacity of the classroom, as well as, beyond the geographic borders of the campus. Establishing effective patterns of use of VLC in large lecture classrooms serves to inform students and faculty about the efficacy and best practices to promote student success.

Implications for Students

One variable of student VLC use that is of note in my study, as well as many others, is the relationship between VLC usage and attendance. The majority of researchers reviewed indicated that attendance was not negatively impacted by VLC use (Fang & Pursel, n.d). Bassili (2008) concluded that students who primarily view videos online are those who were not truly interested in learning or engaging with their peers or instructors. However, few of those studies took attendance, video usage, and performance into consideration as a combination of variables. Williams et al. (2012) indicated that they found a relationship between VLC viewing and attendance. In their study, they suggest that in general, students who are not attending face-to-face lectures are viewing videos. Either approach includes threats to the reliability and validity of the attendance data. In this study, no significant effect was found between video viewing and attendance (interactions between Quantity and Attendance $p = 0.549$; interactions between Frequency and Attendance $p = 0.328$). Attendance patterns for this study are available in Figure 3.

The primary implication for students based on my research may be to inform them of what is effective, i.e., what will raise course performance in terms of VLC usage. In my study, re-watching videos to review content and watching more of the available videos were shown to have a positive effect on course performance. This information should be made available to students in large undergraduate lecture classrooms. This recommendation will be provided to the institution where the original data were collected.

Implications for Faculty

The implications for faculty are similar to those for the students, in that knowing how to advise students about effective use of the VLC technology to increase course performance is beneficial to making that positive impact on student learning. Additional research described in this chapter could also benefit faculty; particularly studies of instructor presence and type of content presented.

Implications for Institutions

Larkin (2010) indicates that many staff and administrators of educational institutions feel that the use of VLC will have a negative impact on attendance. A meta-analysis of current research and future directions in the study of lecture capture (VLC) conducted by Fang and Pursel (n.d.) examined 26 articles and found that in studies that used both surveys and actual attendance collected in class there was no influence or no negative influence on attendance from the use of VLC. These findings are supported in my study by the lack of interaction between video use and attendance, and the lack of statistically significant main effect of attendance and performance (p=0.254; see Figure 6).

Possibly the most profound implication for institutions may be that student performance does not seem to be impacted by students viewing videos as opposed to attending the lecture. The logical next step for institutions with swelling class sizes and fixed amount of space (such as at the one where these data were collected), would be to increase class sizes and make attendance in person optional or by offering an "online only" version of the course that depended on VLC for content delivery. Some faculty and

administrators have expressed reservations about the effectiveness of this learning

environment, but my study and others downplay the importance of face-to-face

attendance (Al Nashash & Gunn, 2013; Dey et al., 2009; White, 2009).

Conclusion

As reported in my analysis of the data, frequency for video viewing and viewing

more of the available videos both have a positive effect on course performance

(Frequency: $F = 3.018$, $p = .030$; Unviewed Videos: $F = 1.875$, $p = .016$) and attendance

does not have a significant effect on course performance ($F = 1.344$, $p = 0.254$). This

study has two major findings. First, frequent review of video course content while not

skipping over videos led to a positive change in course performance. From the

perspective of students and faculty, students who consistently review all or most of the

course video material will be more successful. Second, attendance in a face-to-face class

meeting does not significantly impact course performance when there is access to VLC.

From an administrative perspective, seat time is not required for course success when

there are VLC options. This could open a variety of options for online and blended

models of instruction to replace or enhance the traditional large lecture hall face-to-face

class.

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Appendix A: Original Survey Instrument

1. Person

Person #

2.

	Gender/Sex	**Age in Years**	**Academic Class**
Select the appropriate choices:			

3. Mark the choice for question:

	Never/None	**less than 25%**	**25%-50%**	**51%-75%**	**75%-100%**
How often did you come to class?	Never/None	less than 25%	25%-50%	51%-75%	75%-100%
How many of the videos did you watch?	Never/None	less than 25%	25%-50%	51%-75%	75%-100%

4. How helpful was the video capture?

☐ Very Helpful   ☐ Helpful   ☐ Neither Helpful nor Unhelpful   ☐ Unhelpful   ☐ Very Unhelpful

5. On average how many times did you view each video?

☐ did not view any videos   ☐ 1 time   ☐ 2 times   ☐ 3-5 times   ☐ more than 5 times

6. Where do you watch the videos? (Mark all that apply)

☐ Home

☐ Computer Lab

☐ Library at UB

☐ Library Other than UB

☐ Work

Other (please specify) [   ]

7. I used the videos for: (Mark all that apply)

☐ Reviewing before exams

☐ Supplement in addition to attending lecture

☐ A replacement for attending lecture

Other (please specify) [   ]

8. Which did you do more often:

○ Watch an entire video recorded lecture

○ Review one or a few specific points

○ I did not watch any videos

9. What can we do to make the video capture more helpful or more beneficial to students?

[   ]