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A Phenomenological Study of Games, Simulations, and Virtual Environments Courses:
What Are We Teaching and How?

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ABSTRACT

Educational technology programs from across the United States are offering graduate courses in games, simulations, and virtual environments (GSVE) to their students. However, these courses, until now, have not been systematically studied. This research uses a hermeneutical phenomenological approach to answer the research question: "How do instructors describe their experience teaching GSVE courses?" Five professors of educational technology that have taught GSVE courses were interviewed using a semi-structured protocol based on the TPACK (Technological Pedagogical Content Knowledge) framework. These data were analyzed both analytically and thematically. The results of the study showed a wide variety of topics, tools, and pedagogies are used within GSVE courses. The results had five themes emerge: Focus on Application and Theory, Experiential Learning and Constructivism, Instructor's Prior Experience with Games, Heterogeneous Student Populations, and Range of Technology Tools. These themes as well as these courses are highlighted within this paper. A discussion is provided.

KEYWORDS

Courses, Educational Technology, Games, Phenomenology, Simulations, Virtual Environments

INTRODUCTION

There is little doubt that the field of education is currently being shaped and influenced by several technological forces that have the potential to fundamentally change teaching and learning. One of these forces is the use of games, simulations and virtual environments (GSVE) for teaching and learning. Digital games alone are a $25.1-billion-dollar industry (ESA, 2011) and have become an integral part of contemporary society. Educators within our field are working diligently to understand and harness this technology for educational applications. As the world becomes increasingly complex, interconnected, and technological, GSVE have the potential to facilitate meaningful learning (Williamson, Squire, Halverson & Gee, 2005). GSVE can be "sites of naturally occurring,

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intrinsically motivated learning" (Squire, 2006, p 22). A digital game-based learning approach taps into the intrinsic motivational nature of digital games and synthesizes it with academic content to create engaging instruction (Prenksy, 2003).

Consequently, there is an increasing trend in the field of educational technology to offer graduate courses in GSVE for teaching and learning. These courses are generally taken by both masters and doctoral students within the field. A scan of the educational technology (the term encompasses instructional technology, instructional systems design, learning technologies, etc.) programs housed within the Association for Educational Communications and Technology (AECT) program database helped to identify ten programs that offered a formal course in GSVE. The authors contacted the faculty that taught these courses within their respective programs and asked them to participate in a recorded, semi-structured interview.

The development and implementation of GSVE courses is a relatively new progression within the field of educational technology. Although some of shared their expertise on such courses (Hirumi, Appelman, Rieber, & Van Eck, 2010a; Hirumi, Appelman, Rieber, & Van Eck, 2010b; Hirumi, Appelman, Rieber, & Van Eck, 2010c), the problem of what we are teaching and how we are teaching within these courses remains a central topic for educational researchers. What body of knowledge does our field draw upon for such courses? What is the focus of the courses at various institutions of higher education? What do we hope our students will gain for enrolling and successfully completing such courses? What can employers expect from such students that complete these courses? These are a sampling of questions that one could ask about the design, development, and implementation of GSVE courses.

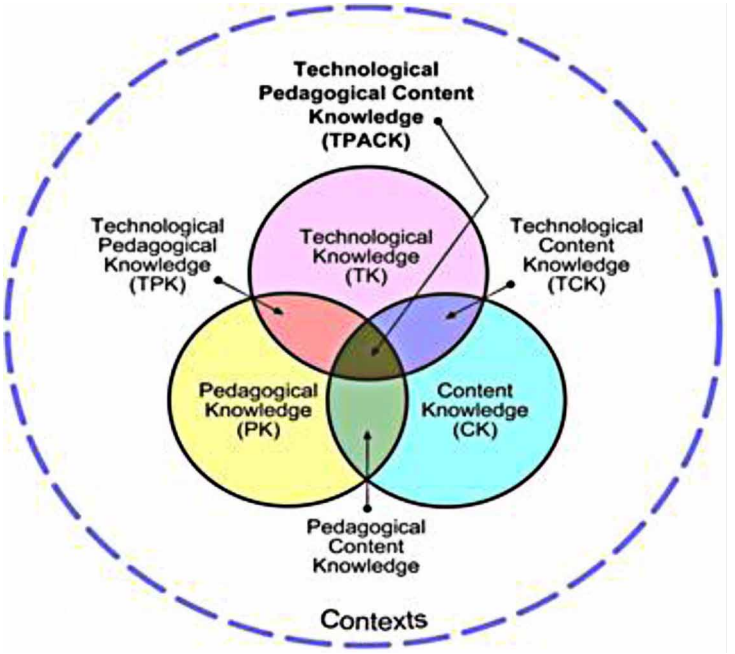
Thus, the purpose of this study is to examine examples of GSVE courses that have been offered at institutions of higher education by educational technology faculty. This research documents the design decisions, theoretical perspectives, and pedagogical frameworks of these courses. A fuller understanding of how GSVE courses are actually being implemented can help provide insight and guidance for future practice and can also contribute to the knowledge base of using GSVE in education. As GSVE become increasingly embedded in society and as GSVE solidifies its presence in education, it is important for educators and researchers to more fully understand best practices regarding GSVE in teaching and learning. This research explores GSVE courses and aims to provide a clear snapshot of GSVE in action by examining the faculty of such courses. The research question guiding this research was "How do instructors describe their experience teaching GSVE courses?" To this extent, we use the Technological Pedagogical Content Knowledge framework as a coherent platform to study such courses in action and to shed light on the design, development, and implementation of GSVE courses.

CONCEPTUAL FRAMEWORK

We chose the TPACK (Technological Pedagogical Content Knowledge) framework to help examine the complex interactions among pedagogy, content, and technology in GSVE courses. TPACK consists of studying three different types of knowledge [Content Knowledge (CK), Pedagogy Knowledge (PK), and Technology Knowledge (TK)] and the intersection among these knowledge areas (Mishra & Koehler, 2006). Each component and intersection of TPACK is situated within a particular context. TPACK explains the instructor's knowledge that results from the intersections (Figure 1).

Pedagogical Knowledge (PK) is knowledge about the practices, methods, and purpose of teaching and learning (Mishra & Koehler, 2006). Instructors in GSVE courses have to make choices about ways to assess student learning, teach to a heterogeneous group of students, and determine the focus of certain areas. Content Knowledge (CK) is knowledge about the subject that is being taught (Mishra & Koehler, 2006). In GSVE courses instructors' content knowledge involves the literature of GSVE, learning theories, different GSVE tools, uses of GSVE in different contexts, development processes, and dozens of other related disciplines (e.g., communications, computer science, digital media, etc.).

Figure 1. Graphical representation of TPACK framework



Technological Knowledge (TK) is knowledge about the tools (Mishra & Koehler, 2006). Knowledge of how to use certain software packages, game engines, modeling tools, and different operating systems would fall under TK. Instructors in GSVE courses have to know how to use a wide range of technology tools to facilitate online interaction to game engines and 3D modeling software packages (e.g., Maya). Pedagogical Content Knowledge (PCK) is knowledge about which teaching methods, strategies, and components fit best for the content (Mishra & Koehler, 2006). Instructors in GSVE courses have to know how to sequence topics, match assignments to content goals, align relevant assessments, and structure meaningful class activities.

Technological Pedagogical Knowledge (TPK) is knowledge about using technologies in educational settings (Mishra & Koehler, 2006). An instructor considers the benefits and tradeoffs of using particular technologies to achieve desired learning goals. Instructors in GSVE courses have to figure out which technologies should be used in an online environment and in class activities. Technological Content Knowledge (TPK) Pedagogical is knowledge about using appropriate technologies to match and enhance content (Mishra & Koehler, 2006). Instructors in GSVE courses have to possess knowledge of how to make create GSVE. For example, instructors in the different courses use a wide range of digital games. In addition, instructors also use a wide range of other tools from wikis, different game engines, and learning management systems.

Technological Pedagogical Content Knowledge (TPACK) is where all the core areas interact and form a teacher's knowledge of how to use incorporate technology effectively with pedagogy and technology choices (Mishra & Koehler, 2006). Instructors in GSVE have to make numerous choices of how to effectively integrate the different core knowledge areas since gaming involves so much technology and multidisciplinary content.

The TPACK framework builds on Shulman's notion of pedagogical content knowledge (1986) and provides a way of thinking about the complex relationship among content, pedagogy and technology knowledge *traditionally* in K-12 contexts. However, the TPACK model is used in other relevant contexts, including higher education (Baia, 2008) and others recommend expanding TPACK

to higher education (Ashe & Bibi, 2011; Ward & Kushner Benson, 2010). Baia (2008) used TPACK to help understand full-time faculty members incorporating of technology in their courses. Mishra and Koehler (2006) first began their qualitative TPACK study on a higher education faculty member.

TPACK has previously been used as a framework to support research on technology integration during case studies of mathematics teachers involved in a learner-centered professional development project (Polly, 2009) and mathematics and science pre-service teachers enrolled in methods courses (Niess, 2005). It has also been used in survey research to ascertain K-12 online teachers' perceptions of their TPACK knowledge (Archambault & Crippen, 2009) and to study how faculty and students develop TPACK in a learning technology by design seminar (Koehler & Mishra, 2005). Similarly, interpretive research examining growth of TPACK knowledge exhibited by in-service teachers enrolled in an online graduate course (Niess, van Zee, Gillow-Wiles, 2010) and design-based research to support TPACK development in pre-service teachers (Mishra & Koehler, 2006) have been published.

Accordingly, we developed a 15-question interview protocol that addresses each of the dimensions of the TPACK framework. These interview questions were carefully reviewed by members of the research team, and were subsequently used during two cognitive interviews with educators in the field of educational technology to ensure the questions were clear in their intent prior to their use in the study.

METHOD

The methods used in this study were guided by a phenomenological theoretical perspective. The aim of such a study is to reveal more fully the essences and meanings of human experience (Moustakas, 1994). According to Patton (2002), there is not a single approach to phenomenology. However, we have aligned with the hermeneutic framework for understanding the essence of the research question "How do instructors describe their experience teaching GSVE courses?" "Hermeneutic phenomenology is a human science which studies persons" (van Manen, 1990, p. 6).

Research Design

In order to gather a rich description of the essence of teaching GSVE courses, extensive interviews with participants were conducted. Interviews served as the primary method of data collection, focusing on the content, pedagogy, and technology of GSVE courses. The interview questions can be found in the Appendix. The interview questions were developed by the members of the research team and reviewed for clarity by two educational technology faculty prior to data collection. We used the TPACK framework and the traditional Analysis, Design, Development, Implementation, and Evaluation instructional design model as guides for creating the interview questions. A secondary data source was the actual syllabi used for these courses that were created by the instructors interviewed in this research. Both data sources informed the subsequent coding and data analysis, which is clearly outlined in a subsequent section of the manuscript.

Population

Interview participants were selected based on their experience teaching GSVE courses. First, the research team reviewed educational technology program websites via the AECT program database for courses in GSVE. Following this review, the respective faculty at ten institutions received invitations for interviews. Only five participants, two of whom were from the same school, responded to the call. According to Patton (2002), sample size in qualitative research is ambiguous and greatly depends on how many participants are necessary to provide "expected reasonable coverage of the phenomena" (p. 246). Lincoln and Guba (1985) add that sample size is adequate when the information gathered from the participants become redundant. Given the unique nature of this study and the limited population to draw from, the team determined that five participants would be sufficient for the study and to begin an effective dialog within the research community. However, the research team does not claim that

saturation was reached across all questions from the interview. As will be discussed, there was great variability across the five course instructors interviewed.

Data Collection

Each faculty member participated in one semi-structured interview via Elluminate Live. The features of this online meeting software allowed sessions to be recorded for later analysis. Furthermore, a whiteboard feature made it possible to upload the interview questions as text for clarity during the interview. Figure 2 provides a screen shot of Elluminate Live. All interviews were directed by one member of the research team.

Data Analysis

The interview data was analyzed according to van Manen's (1990) hermeneutical phenomenology approach in concert with Creswell's (2003) process for analyzing qualitative data. Specifically, we chose to analyze the data *thematically* and *analytically* (van Manen, 1990). Cresswell's (2003) approach includes:

- Organizing and preparing the data;
- Reading through the data to get a sense of the participant's experience;
- Coding and organizing the data into meaningful units;
- Formulating the data into themes;
- Transforming the themes into a descriptive narrative;
- Interpreting and making meaning of the data.

Pseudonyms were used for all participants to maintain anonymity. The data was analyzed by two members of the research team independently first. The two members of the research team discussed differences in emerging themes and resolved these differences through meaningful discussion. We did not calculate agreement rates for our coding since we used discussion as a mechanism to resolving differences in opinion. The interviews lasted an average of 45 minutes. The transcriptions from the interviews were an average of 8170 words.

Figure 2. Annotated screenshot of Elluminate Live

Methods of Rigor

Lincoln and Guba (1985) described several methods to demonstrate the quality of a qualitative study, including credibility, transferability, and confirmability. In this study, credibility was established through member-checking and triangulation (i.e. using the syllabus). All participants had the opportunity to review their transcripts of their own interviews to verify accuracy. Further, the course syllabi were used to expand the researchers understanding of the interview data. Transferability was addressed by the use of thick descriptions. Thick descriptions involve creating a detailed account of the experiences as developed through the interview process. Finally, confirmability was established through the use of an audit trail. The audit trail was essentially a detailed description of all the research steps taken throughout the process. We used an audit trail throughout the research process.

Researcher Bias Statement

All the researchers involved with this research project are advocates of the meaningful incorporation of GSVE into educational processes. Further, all authors are either graduates of educational technology programs or graduate students within an educational technology program. These observations are important because it could potentially taint the interpretation of the results. Thus, the authors submit this *caveat lector*.

RESULTS

Analytic Analysis

In using the analytical approach, the team analyzed all interviews and syllabi from each participant to extract useful anecdotes related to the content, technology, and pedagogy.

Dr. Mike Phillips and Dr. John Ready: Both Dr. Mike Phillips and Dr. John Ready co-teach a graduate level course titled *Educational Games and Simulations* for a university in the western United States. When asked about their history with gaming, both instructors identified themselves as gamers. Dr. Phillips remembers first playing *Pong* when the ball was still a "square" on the screen. These co-teachers came to GSVE from two different perspectives - music and education. Dr. Phillips discussed the strong relationship between his experience as a music composer and game-design. He describes "my background starts with me as a music composer and the process of composing music is essentially the creation of an abstract symbolism of that someone else is going to simulate." This interpretation and "replaying" of a program is analogous to game development. Dr. Ready discussed his background in education, which informed his interest in the course.

The department chair identified the need for their course. In Dr. Phillips words, "I would say that it was a demand from administration based on a publication that led to the creation of the course." Prior to being invited to teach the course, Dr. Phillips had co-edited a leading book on the topic of games-based learning. Their course fundamentally differs from traditional courses in that it is organized as a game, complete with challenges, tasks, and rewards. The course design itself facilitates exploration and research into games. The instructors see this as the strongest component of the course's design.

Dr. Phillips and Dr. Ready contributed to the design and development of a game-based course management system in which traditional learning tasks are organized as "quests". Learners complete these quests to demonstrate their knowledge and skill development. They use the game-based course management system to deliver the course entirely online. Additionally, Dr. Phillips and Dr. Ready host regular synchronous sessions on a private island in *SecondLife*. Their focus in these sessions is exploring the connections between traditional learning theories and game design. Dr. Phillips asks the question: "what is it about learning theory and game design theory that come together as we create a game design?" Both see this connection as a primary component of the course.

The target audience for their course is instructional designers and instructional technologists within the field. The instructional goals for the course vary based on the students' individual interest

areas. Since the learning tasks are based on quests, not every student completes every quest in the course. The game-based course management system that they developed for this course currently has 69 available quests. Students can select learning tasks that match their own needs or learning goals. In Dr. Ready's words, each individual student develops their own "personalized theory of learning" throughout the course. The game-based course management system tracks their completions and enables the students to earn badges after completion of a set of quests.

Their game-based course management system also enables students to vote for their favorite quests and track the amount of time it took to successfully complete the quest. These votes and completion times are tracked and made visible to the students so that they can make informed decisions about the completion of a given quest. Dr. Ready explained that this allows students to make decisions like, "Oh this [quest] only takes eighteen minutes well I have a half an hour that'd be perfect." Both instructors noted that not every quest is at the level of perfection they would prefer. Thus, the game-based course management system is flexible and can be altered while the course is live.

In terms of evaluation, the quest results are either approved by the instructors or sent back to the student for further revision. However, as noted by Dr. Ready, "I don't think with the exception of maybe one or two I've had to send any back." When asked what tools are being used in the course in addition to *SecondLife* and the game-based course management system, Dr. Phillips stated "This would be a long list!" In their design projects, the students are able to use any game, virtual world, or simulation based on the quest they decide to complete. So, students naturally use several different tools.

Dr. Thomas Blue: Dr. Thomas Blue is a researcher and teacher at a university in the Midwest United States. His father is a programmer and systems analysis who introduced him to his first video game. Dr. Blue first started playing *Cave Adventure* on a 8.5 inch floppy with his brother. Although he does not identify as a "heavy gamer," he pursued his graduate studies in multimedia learning and educational games. For his dissertation, Dr. Blue programmed a digital game about mathematics to study transfer of learning. Dr. Blue teaches a graduate course titled *Instructional Simulations and Games*.

When Dr. Blue took a position in the academy he decided to start a gaming course since it was is area of expertise. The course was not created because of student demand, but once the course was started it was well received and popular. Dr. Blue still teaches the course and has a wide range of students. Some students are only seeking certificates while others are doctoral students. Dr. Blue believes the course focuses on practical application, research issues, and theoretical foundations. Dr. Blue believes strongly in teaching the theoretical foundation since many people are not aware of prior research or can talk about how learning is occurring in games. He finds that many people want to start creating games right away without understanding the theoretical foundations and complexity of learning in educational games.

Dr. Blue's course is a blended course that uses *Adobe Connect* to include students taking the course online. He uses a phone system to connect students to audio since he finds connecting with headsets cause all sorts of technical issues and have poor audio quality. The delivery systems has evolved over time, but now uses tools like *Elluminate Live* to share and take control of other people's screens which is helpful when students are trying to demonstrate games.

He begins his course playing the text based game *Cave Adventures.* He believes that some people have a misconception about games that they are all graphics and sound but he wants students to focus on the engagement factor. Later in the semester, they play more advance games and platforms and use the Kinect. Theory drives the type of games played every week for Dr. Blue. He also starts with students reading about serious games, motivation, and self-efficacy and then moves to communications theories about the effects of violence of video games. Dr. Blue starts his course with "lighter" readings that give his students an overview of the field that eases students who do not have a background in games into the content.

Dr. Blue places a strong emphasis on his course in discussion and organizes debates in his class to discuss readings and ideas. He gives students the questions the night before and they have to be able

to discuss and defend. Dr. Blue also has students go through an instructional design process with a game where they plan instruction involving a game. Students also have the option to design their own educational game. However, students do not have to code the game from scratch and the emphasis is placed on the design decisions. Since not all the students in his class are game players, Dr. Blue has them write a post-mortem to analysis the possible instructional value of a game. Students additionally have to complete a book review on digital games in his course. There are no exams in the course but quizzes are used as a learning strategy. He does not focus time on using a game engine to design a game since the process is so complicated and takes away time from focusing on the large ideas.

Dr. Brett Davidson: Dr. Brett Davidson started his career teaching computer technology courses in the K-12 context. Later, he went back to school to complete his doctoral studies in the field of educational technology. His first gaming experience in an educational context dates back to the release of *Oregon Trail*, which he said inspired his interest in the western expansion and the utility of games and simulations for education. Since starting his first faculty role, he has been offering a course focused on virtual worlds and their potential for educational applications. Specifically, the course he teaches is called *Virtual Worlds Research Seminar*. As the name implies, the course is taught to graduate students (both masters and doctoral) within the field of educational technology.

Dr. Davidson expressed that he was the only professor in the college of education at his institution conducting any research within the context of virtual worlds. As such, his course is focused on the research applications of virtual worlds. Dr. Davidson has his students synthesize current research on the application of virtual worlds to education and then they have to propose their own Institutional Review Board (IRB) approved study on virtual worlds. In terms of instructional goals, Dr. Davidson said that is for students to develop an awareness of virtual worlds in general. The second goal is for the students to apply what they have learned in their previous courses focused on research for the design of a robust applied research study within the context of a virtual world environment. His thought process on having students conduct their own research was that they would potentially exit the course having a publication which would make them more competitive for a job search.

Dr. Davidson has the students complete a number of smaller scale activities to better prepare them for the research project within the course. For instance, the students had to identify quality articles that focused on GSVE; carefully read the articles; and report back to the class the research methods, the frameworks, and the findings associated with the research. Since the primary goal of the course was to have students develop their own unique research projects, Dr. Davidson structured all of the activities to support this endeavor. Classroom discussions were seminar-based with students leading the discussion. Dr. Davidson said "I only chimed in when I thought there was something in the article that was being overlooked either by the presenter or by the students in the class." He also had the students write reflections about the activities at different points in the semester to have them be more metacognitive of their own learning.

When asked about he decided to sequence the topics within the course, Dr. Davidson said that the course was largely driven by the IRB approval process. Since it can take several weeks to gain IRB approval, Dr. Davidson structured the activities to support the research project. The course has been offered only face-to-face. However, Dr. Davidson did express that in the future he would like to offer the course entirely within *SecondLife*. He also indicated that the most challenging part of the course was teaching students about sound research methods. Since the course had a combination of both masters and doctoral students, their relative skill sets was a mix. In fact, he said that the students actually picked up on the technology rather quickly in saying that "the actual virtual worlds environments and those things were not difficult at all in terms of teaching that, students were pretty quick to pick up on those items."

Dr. Davidson said that the assessment of student learning was fairly typical: reading papers and providing feedback. He did indicate that some of the assignments were not essay-like (e.g., getting IRB approval), but most of the work was in written form. In terms of technology, Dr. Davidson was using *SecondLife* and *World of Warcraft* to communicate the ideas about the virtual world platforms.

He said he did not use any other games or simulations. He re-iterated that the most important things students should walk out of his course knowing is an awareness of the existing research on virtual worlds, and a strong understanding of what it takes to implement a research project from idea to completion.

Dr. Jonathan Davis: Dr. Jonathan Davis started his initial gaming experience in school with games like *Oregon Trail* and *Carmen San Diego* in the 1980's. As a programmer, he has been developing various games using software programs such as *Flash*. He had two important gaming experiences that shaped his gaming experience - working for the military and his doctoral program in education. Specifically, his professional experience for game design developed while working for a large management consulting firm and the Department of Defense. Developing different kinds of games and simulations for the military enabled him to prepare for teaching his gaming courses. Throughout his doctoral program, he was able to attain theoretical knowledge about game theory, cognitive theory of multimedia learning, and game development.

As a game design instructor, Dr. Davis' courses have focused on exploring the latest games and understanding what motivates people to play games. For instance, he mentioned "I feel like a lot of people are very focused on the computer, but they don't understand what the Xbox is doing. The Xbox is huge... It is just linking gaming to every sector of your life such as what music you listen to and things that like we would be doing in motion with Microsoft Kinect." His gaming course exposes students to playing various games such as *World of Warcraft*. He believes that playing games helps increase understanding of multiple genres and can train students to work better with programmers.

Dr. Davis's designed the course for instructional designers and teachers. In his class, students discussed games in K-12 education as well as how to design these games. The course included a combination of research, teaching, design, and development. The design of the course included substantial amounts of scholarly reading about gaming. Through a combination of gameplay and theory, he taught game design and development. Students in his classes have developed simulations for mobile devices and made an actual game using *GameMaker*.

A major instructional design goal is to explore the latest research and trends with an emphasis placed on being aware of what is out there. Another instructional goal of the course is to enable students to evaluate the games for their effectiveness based on relevant criteria outlined by the academic literature. Dr. Davis stated that "the goal would be to understand the game literature, current research and gaming, what are the current trends in gaming, and typical audience of the games."

Assignments in the course included evaluating game engines and games, developing mobile applications in *GameMaker*, a book review, and written papers. He assigned books on gaming to student groups, and each group analyzes the content to write a book review. Evaluation of the course is based on assessment of student learning through the various projects. Participation and class attendance are another category of the evaluation process. Creating and designing games and then evaluating the various games in groups are important feedback methods. The students in Dr. Davis' course used a variety of software programs, such as: *GameMaker*, *Unity 3D*, *World of Warcraft*, *Google App Inventor*, *SecondLife*, *America's Army*, *Torque 3D*, *Poser*, and *3D Max*.

Overall, the course offered a blend of theory and practical application. The gaming course has been successful in both face-to-face and online class. For instance, students attend online classes and discussions through a virtual classroom, *Wimba*. In addition, the instructor used various online tools to teach the concepts of game design. He showed various 2D and 3D game engines as well as PC, mobile devices, tablets, and military games. Specifically, *America's Army* provided various simulations like helicopter simulators. Dr. Davis expects his students to be successful in both the private sectors and government sectors by having a full understanding of basic design that can motivate people and situations when games should be applied in some settings.

Thematic Analysis

To analyze the data, the research team engaged in a thematic analysis across the interviews and syllabi from the respondents. The coded data was examined and five main themes emerged: *Focus on Application and Theory*, *Experiential Learning and Constructivism*, *Instructor's Prior Experience with Games*, *Heterogeneous Student Populations*, and *Range of Technology Tools*. Meaningful anecdotes were extracted from the interviews to provide context in relation to each of the themes discussed.

Focus on Application and Theory

The first major theme from the data is that the courses focused on the blending of application and theory. Dr. Blue expressed, "I believe that you can't just teach practice without teaching theory, you've gotta know a little bit of both, because practice has to be driven by theory, and theory emerges from practice." Likewise, Dr. Davis integrated theory and application, "obviously started with all the theoretical stuff. From the theory what I did was each week we actually covered different topics within the game. We talked about game engines one class and *GameMaker* another class. We were actually developing *GameMaker*, and then we talked about various types of games. I went through the research, the design, the development, and lots of examples." This theme came out in Drs. Phillips and Ready's course as well. They spent time focusing on the development of each individual's concept of learning theory and how it relates to application, as discussed by Dr. Phillips, "what focuses the course is individual development of one key idea for a game that someone develops over several weeks going into depth about their theory of learning, their understanding of game design, and using the rest of us in the course as a studio art critique group for the evolution of a detailed design that could then be taken forward to a design team or hawked somewhere out in the real world or implemented in some future world." Dr. Davidson lamented how, "they [games] may change shape, and I think they will as technologies evolve but there's going to be a continued need for people to understand what kind of research is out there related to gaming and simulations and virtual worlds, and it's a need that right now is being under filled and underserved." Each course deals with the issue of theory and application balance, but each approaches the challenge of covering and integrating game theory using a different instructional strategies and projects.

Experiential Learning and Constructivism

The second major theme to emerge from the data is that proponents of educational games share a constructivist perspective and extol the benefits of experiential learning. While constructivism is a large topic outside the bounds of this manuscript (Cunningham & Duffy, 1996), we identify this as a theme based on the accounts of each of the instructors within the GSVE courses. The instructors of each course designed class experiences and projects around these theories. Dr. Phillips and Dr. Ready actually designed their whole course around a game, as stated by Dr. Ready, "the course itself is one large example of a game-based approach. You know, the course is educational games and simulations, and we try to introduce them to a number of different, gaming concepts." The instructors for the course talk at length about how they used evaluation and gameplay in his class activities. As discussed by Dr. Blue, "as far as in class activities, we did a lot of evaluations of various game engines and games. We would go in and play around with games. For instance, we spent a class or half of the class, playing *World of Warcraft* to just feel the game. Dr. Davis stated, "The other big thing is that I want students to come out of the course potentially with a publication so that being doctoral students they can become better candidates for jobs that are out there than what our current course offerings have."

Instructors' Prior Experience with Games

The third major theme is that all the course instructors all have had prior experience with digital games including playing, designing, and studying them. Dr. Phillips and Dr. Ready expressed interest

in studying games when Dr. Phillips stated that "as a game developer, as a person who has edited collections of what other people are doing about games and simulations." Dr. Blue reported exposure to digital games while completing his graduate work. Dr. Blue noted that they "took a course on simulations and games as a doctoral student" and that the first game they remember playing was *Cave Adventure*. Another instructor mentioned that their current work in digital games was a continuation of previous work. Dr. Davidson stated that their current digital game-based course "is an outgrowth of work that I used to do at the University when working for the supercomputing center there." In the past, Dr. Davis reported "developing a lot of games and simulations for the military."

Heterogeneous Student Population

The fourth major theme of the data is that the courses have varied and heterogeneous student populations. The target population of the courses ranged from classroom teachers to instructional designers to emerging scholars within the field. For example, Dr. Phillips and Dr. Ready's course was designed to be meaningful to a wide range of students, including practicing teachers and instructional designers. Dr. Phillips specifically stated that after taking the course, they wanted their students to think, "Hey, I think I could be a game designer" or "Hey, I can completely redesign my fourth-grade social studies class to become a game-like experience." Dr. Blue stated this about his students: "I want them to be able to be, to be instructional designers." Dr. Davidson's student population was "a mix of masters and PhD" students. While Dr. Davis noted that his course was "primarily designed for the instructional designers."

Wide Range of Technology Tools

The final theme is that the instructors in each of the four digital game-based courses used a wide variety of tools in their courses. Dr. Phillips and Dr. Ready used tools such as game-based course management platform and *Scratch* game design platform while Dr. Blue used the *Neverwinter Nights* game design toolset. Dr. Davidson used standard course technologies such as Wikis and *Elluminate Live*, but also used *World of Warcraft*. Dr. Davis utilized the virtual classroom platform *Wimba*, PCs, mobile devices, and tablets. It also included the use of games such as *World of Warcraft* and *America's Army.* Some instructors also chose to implement some game development tools including things like Unity, 3DS Max, and Torque 3D.

DISCUSSION

In this study, interviews with experienced GSVE professors from four different universities portray dynamic and creative approaches to teaching as well as a variety of content coverage. Particularly, as shown in the results of the study, data analysis from the interview transcripts and course syllabi revealed five important themes in teaching and learning GSVE courses: *Focus on Application and Theory*, *Experiential Learning and Constructivism*, *Instructor's Prior Experience with Games*, *Heterogeneous Student Populations*, and *Range of Technology Tools*. The instructors have not only focused on providing practical knowledge of educational games and design, but also grounded their GSVE courses in the gaming and educational technology literature. This blend of theory and practical exposure to games and design tools provides learners a foundation for their future careers as educators, game designers, and instructional designers.

Not unexpectedly, the course designers' backgrounds, whether education, design, or game development, influenced their course design as did their personal gaming experience. A variety of early and sustained gameplay experiences were shared by the instructors. Furthermore, professional careers outside of academia (as composers, military instructional designers, etc.) allowed this set of game course instructors to develop a variety of creative approaches to the topic of GSVE courses. A shared approach was to ensure that students themselves experienced many types of game genres, styles, and interaction levels. In addition to their rich experiential instructional design, all the professors,

utilized a wide range of technology tools such as *Wimba*, *SecondLife*, and mobile devices while teaching various students from different backgrounds.

This study implies that GSVE professor, learners, and educational practitioners may improve their teaching and learning situations through the best practices culled from this phenomenological research: GSVE professors should not only have substantial knowledge about gaming research and theory, but they should have diverse gaming experience as avid game players, be abreast of current trends in gaming, and be able to use a wide range of technologies and platforms. Further, GSVE professors must be ready to prepare students with a range of learning goals. Providing options that meet students learning needs whether they plan on a career in instructional design, K-12 teaching, school technology administration, or in the gaming industry. GSVE professor should provide experiential learning opportunities within their courses and apply game design principles to their learning environment.

This paper in many ways provides a starting place and road map for instructors seeking to implement their own GSVE courses at their respective institutions. Taking into account the TPACK framework and the accounts and experiences of the instructors noted in this paper, a potential instructor might start to develop a plan to enact these ideas in their own professional practice by using some of the many ideas presented in this paper. What design elements would a potential instructor want to include within their course? Would they focus on teachers, instructional designers, or emerging scholars? What technologies would be most appropriate for my learning experience? What readings and activities might the instructor choose to integrate into their coursework?

TPACK was helpful in capturing the essence of the instructor's knowledge surrounding GSVE courses and their deployment with students. From a TK perspective, instructors of GSVE courses must be knowledgeable about several gaming platforms, game genres, and development packages to successfully teach these courses. From a PK perspective, the instructors must be knowledgeable of several pedagogical strategies to engage the students in the topics of the course, including but not limited to constructivist and experiential learning strategies as well as direct instruction. From a CK perspective, we see that the instructors have all selected a variety of games, simulations, and virtual worlds to communicate the content. Further, the instructors are using some common readings and ideas that emerge from the field of educational technology. Of course, how all of these areas converge in TPACK is the key to the successful implementations we have observed in this manuscript.

This study has shown limitations in exploring GSVE courses using this framework. Only a small number of educational technology programs have GSVE courses making it difficult to collect information from a large number of course designers. Furthermore, there is insufficient evidence of TPACK framework applying to higher education. However, it is meaningful that the results of study provide educational game researchers and instructors ideas for teaching GSVE courses and these findings can be extended in future research. Of course, all of our research is based on the honesty and willingness of the participants to share their expertise and experiences. Another limitation is that we collected no evidence from the course instructors about their ongoing professional development and the frequency to which they keep up with trends in the broad world of games, simulations, and virtual worlds.

Future research directions could explore GSVE courses in informal learning environments instead of taking traditional settings as a primary research context. Since the majority of students have practiced their gaming experiences outside of their schools, and have extended their learning experience in the informal learning contexts, the future research should take into deep consideration of how students improve their learning skills such as problem-solving skills while playing games at informal learning environments at home, computer labs, public libraries, and Internet Cafes. GSVE courses are still relatively new to colleges and schools of education. Systematically studying the instructor's pedagogy choices, selection of technology tools, and the content of the course will benefit the community of educators by spreading innovation and insights. Further, this knowledge will be particularly useful to other programs looking to adopt such courses in their own curriculum.

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APPENDIX

Interview Questions

1. Please describe your history with educational games and simulations. What experiences do you have that helped you prepare and teach this course?
2. Describe the process of deciding to teach the course for the first time. Was there demand from students? Administration? Your department?
3. What is the focus of your course? For example, research, teaching, design, development, or a combination. Please describe.
4. Who is the intended audience of your course? For example, teachers, instructional designers, instructional developers, or all the above. Please describe who you had in mind while designing this course.
5. What are the instructional goals of your course?
6. When planning the course, what were the most salient features of your design?
7. What types of assignments did you plan in your course?
8. Tell us about how you decided to sequence the different topics in your course.
9. Describe the process of teaching the course. Did your initial design work well in practice or were there adjustments that improved the course?
10. Is the course offered just face-to-face or online or blended? Please describe the delivery system.
11. What topics were the most challenging to teach about?
12. What kinds of evaluating methods are you using for your class? Are they the same as other classes that you have taught before?
13. What tools (e.g., Unity), if any, are you using in your course to teach the concepts?
14. What do you hope students came out of your course thinking about?
15. Are there any other details about you or your course that you think are important to tell us?