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Author(s): Jon Scoresby and Brett E. Shelton

Source: *Instructional Science*, May 2011, Vol. 39, No. 3 (May 2011), pp. 227-254

Published by: Springer

Stable URL: https://www.jstor.org/stable/23882801

Instr Sci (2011) 39:227–254
DOI 10.1007/s11251-010-9126-5

Visual perspectives within educational computer games: effects on presence and flow within virtual immersive learning environments

Jon Scoresby · Brett E. Shelton

Received: 9 February 2009 / Accepted: 21 January 2010 / Published online: 4 February 2010

Abstract The mis-categorizing of cognitive states involved in learning within virtual environments has complicated instructional technology research. Further, most educational computer game research does not account for how learning activity is influenced by factors of game content and differences in viewing perspectives. This study is a qualitative exploration into the nature of flow—the state of being absorbed by an activity, and presence—the sense of "being there" in a virtual learning environment. This study follows players' experiences within an immersive environment, with the notion of "immersive" being the extent to which the computer system delivers a surrounding environment. The data analysis includes videotaped activity, transcripts and interviews of six different games, three of which have explicit learning objectives derived from two different genres. While viewing perspective was previously thought to have significant influence on presence, flow, and learning, these findings suggest that four emergent categories (content, emotion, motivation, engagement) have more influence than perspective.

Keywords Games · Perspective · Presence · Flow · Immersion · Virtual environments

Introduction

Within the field of artificial environment research, there is confusion between definitions of *presence* and *immersion*, especially with regard to *flow* within learning contexts. Presence and immersion, often used synonymously, are terms for cognitive states that affect learning during activities within technology-rich environments. Technological innovations for learning, such as the use of desktop-virtual and mixed-reality environments—those that are partially real and partially virtual—have added new complexities to the ideas behind presence and immersion that previous definitions either do not address or do not fully encompass. Accordingly, the mis-characterization of the definitions of immersion and

J. Scoresby · B. E. Shelton (✉)
Department of Instructional Technology and Learning Sciences, Utah State University,
2830 Old Main Hill, Logan, UT 84322, USA
e-mail: brett.shelton@usu.edu

presence has unnecessarily complicated the interpretation of results from more recent research involving virtual learning environments. Dede's (2009) research shows that interest in immersion and presence within virtual environments for learning remains current and relevant.

Researchers consistently refer to the link between presence, the sense of physically "being there" in a computer generated environment, and positive learning outcomes despite the variations among the learning activities that take place in virtual environments and the different kinds of virtual reality interfaces (e.g., Azuma et al. 2001; Hedley et al. 2002; Winn and Windschitl 2002). Researchers generally acknowledge that immersion, the extent to which the computer system delivers a surrounding environment, is a vital element in contributing to the sense of presence and therefore may also be linked to positive learning outcomes. Yet, Slater (1999) warned that researchers and educators should not assume presence is positively correlated to task performance. Research is needed to explore the nature of immersive technology and presence with regard to their roles in learning activities. For the purpose of this study, the "immersiveness" of the technology characterized by different viewing perspectives is used to further explore the role of presence and flow within virtual learning environments. Viewing perspective is parsed into three categories: first-person perspective, the player's vision and actions are as the main character in the game; third-person perspective, the player views and controls the main character in the game much like a puppet; and "without" viewing perspective, the player sees nothing but text. The concept of *flow*, or the state of being cognitively engrossed by an activity and characterized by high levels of enjoyment, loss of awareness of time, and better than normal performance, is also linked with positive learning outcomes and is often confounded with issues of presence within the research literature (Csikszentmihalyi 1988; Witmer and Singer 1998). To explore the nature of presence and flow in immersive systems, it is necessary to find how different viewing perspectives impact presence and flow given the wide range of technology that is available and in use. Therefore, for this study, we are choosing to use the definition of immersion as the extent to which the computer system delivers a surrounding environment in an attempt to help clear the confusion or mis-categorization of immersion and presence among researchers in the field. By using this definition of immersion, the findings will help clear the confusion by discussing the roles of presence and flow within technology-supported immersive learning activities, and provide a consistent vocabulary across future research with regard to real, virtual, and mixed-reality immersive learning environments.

Based upon these premises, the research questions explored in this study are:

- What emergent properties are of greatest influence on presence and flow, given (in light of) these different viewing perspectives?
- How does the viewing perspective of the player impact his/her feeling of presence and flow?
- What, if any, are the links between learning strategies, presence, and flow in a designed learning exercise using computer games with different viewing perspectives?

This paper describes research that addresses the nature of presence and flow, their roles in students' learning and how presence and flow are affected by experiencing different viewing perspectives in virtual game environments. The findings are presented in sections which discuss how feelings of flow and presence are influenced within a specific viewing perspective. Research on the relationships of presence and flow to learning in a specific kind of computer-generated environment (through different viewing perspectives) accomplishes three goals. First, it helps clarify the definitions and uses of the terms to

include interfaces across the spectrum of real to 100% computer-generated learning environments, that is, a spectrum of technological "immersiveness." Second, it helps to identify links between learning strategies, presence, and flow through specific types of viewing perspectives in virtual educational environments. Third, it helps make the distinctions between how one reaches feelings of presence and flow.

Therefore, the first research question is answered by considering current frameworks for researching the relationships between the spectrum of immersive systems, presence, flow and learning and applying these frameworks to a more broadly defined set of virtual environments (e.g., Bystrom et al. 1999). The objective is to refine and inform future research with improved terminology. To address the second question, we investigate what role viewing perspective plays within immersive environments for game players to reach a substantive level of presence or flow. A qualitative analysis of responses to interview questions and an analysis of students' videotaped activities were performed to identify relationships and distinctions between cognitive states and the learners' interactions with virtual objects. Discussing the outcomes of the first two questions, through the use of a specific computer game designed for educational purposes, helps address the third question: how are presence and flow linked to learning?

Theoretical perspective

Since the application of virtual reality environments as learning contexts, researchers have questioned the effects of presence and immersion in learning activities (e.g., Sheridan 1992; Winn et al. 2002; Hedley et al. 2002; Woods et al. 2003). Some early results indicated a "link" between presence and student learning, with correlations between positive learning outcomes and students' self-reports of degrees of presence (Witmer and Singer 1998). High levels of presence may involve the focusing on a task within the virtual environment, or contrarily, high levels of presence may involve the perception of being enveloped, thus being acutely aware of the perceived environment regardless of task. Understanding the nature of presence in virtual environments has been further compounded by a number of studies that are based on the assumption that the positive correlation between presence and learning is a given, regardless of the type of virtual environment or the type of administration of the learning activity (e.g., Barab et al. 2000; Dede et al. 1999; Fjeld et al. 2002; Winn et al. 2002; Woods et al. 2003).

If researchers are to investigate and make meaningful claims about the role of presence in learning, the working definition of presence for virtual environments must be expanded to be applicable to environments in the entire virtual-to-reality spectrum. We postulate that presence contains a component defined as the level of one's awareness of the environment and whether or not the expected perceptions are consistent with sensory input. Learners may be at a level of presence whether they are actively engaging in the real environment, a virtual environment, or a mixed-reality environment. The awareness of one's environment and the task in which the learner is engaged may affect the role that computer-generated objects play in the way in which one understands complex phenomena.

Slater (1999), citing numerous other papers on the topic, concluded that presence is a subjective phenomenon that includes three main components. Although Slater's three components are based upon 100% virtual environments, we have modified them to refer to environments that exist along the reality-virtuality spectrum to be appropriate for this research. The first component of presence is the sense of "being there" in the environment. The second component of presence includes responding to events that may occur in or be

created by the computer-generated environment rather than the real one (i.e., events precipitated by computer-generated environment are dominant over those in the real world). This second aspect may be more applicable to mixed-reality environments that contain more virtual objects than real ones. The third component of presence is the learner's memory of the virtual components of an environment as being part of the whole environment, rather than distinguishing "virtual" parts from "real" parts.

Similar to the issues with "presence," the term immersion has been assigned different meanings depending on the research literature and context. Immersion has been defined as both a physical component of virtual reality environments (i.e., an "immersive virtual reality" environment) which is completely generated using computer graphics and a psychological state in which one is enveloped by, included in, and interacts with an environment provided that the environment produces a continuous stream of stimuli and experiences (Witmer and Singer 1998). Thus, in Witmer and Singer's research, having a sense of immersion is necessary for the learner to experience presence, but other factors such as "attention," "focus," "involvement," and "engrossment" may affect the level of presence independent of the learner's sense of immersion. However, given the assumed coupling of such cognitive states as "attention" and "engrossment" with task performance, the role of immersion in presence will continue to be problematic if Witmer and Singer's definition is used.

For this research, the characterization of immersion or "immersive system" is the extent to which the computer system delivers a surrounding environment, one that blocks sensations from the real world, accommodates many sensory modalities, and has rich representational capability (Slater 1999; Slater and Wilbur 1997). By changing viewing perspectives of the game play activity within each of the desktop environments from first-person, third-person, and "without-viewing" perspective, we are changing the extents of "immersiveness" of the system. Cognitively, first-person perspective has been defined by how we center a subjective experience on our own body and third-person perspective has been defined by how mental states are attributed to someone or something else (Vogeley and Fink 2003). First-person is also used in narratives and cognitively, this perspective allows for agency by the one in control (Gallagher 2000). The sense of presence is defined as the feeling of being in an environment even if one is not physically there. The feeling of presence is also congruent with the environment and the situation within that environment (Robillard et al. 2003). When someone is focused on the situation they become aware of what is in their environment. Attending to and recognizing the artifacts within the environment help add to the sense of presence (Fontaine 1992). Some researchers have written that presence and emotion are not connected (Slater 2003). Others have said that emotions are how we experience our environment and that emotions may play a role both as a way of determining and a cause of the feeling of presence (Baños et al. 2003). The emotional nature of the experience is a factor to investigate with the intention of establishing relationships to both presence and flow.

At least one leading researcher has used categories of involvement, concentration, loss of sense of time, loss or lack of self-consciousness, and a feeling of superiority over self to characterize flow (Csikszentmihalyi 1988). These measures all lead to an intrinsically rewarding experience. The feeling of flow is what motivates people to do something that brings them intrinsic rewards (Csikszentmihalyi 1997). To reach a substantive state of flow, a person's skills have to be just right to deal with the challenges of the situation (Csikszentmihalyi 1988; Hargadon 2001; and see Rieber 1996). If the skill level is too low, a person will not reach a state of flow due to frustration of not performing at a desired skill level.

As described, flow is experienced as a product of one's own actions, whereas feelings of presence within a virtual environment result from experiences that are influenced by the

objects of the external environment. Marsh and Jackson (1999) used the Flow State Scale to assess feelings of flow experienced by athletes. Flow State Scale questions in their research included both the person and the actions they performed during a sporting event. For example, respondents were asked to rate the strength of statements such as, "I was challenged, but I believed my skills would allow me to meet the challenge," and "I made the correct movements without thinking about trying to do so." Reviewing Witmer and Singer's questionnaire (1998), questions relate to feelings of presence, specifically how the environment involves or influences the individual. For example, respondents addressed questions such as, "How natural did your interactions with the environment seem," and "How well could you move or manipulate objects in the virtual environment?" The distinction between flow and presence in these examples is that feelings of flow are determined by an individual's activity and feelings of presence are determined by how the environment assists or distracts the individual.

With regard to previous research of presence and flow in specific contexts, Slater (1999) states that quantitative measures have serious drawbacks. Presence is a phenomenon that is largely subjective and is likely dependent on many ill-defined variables. Yet, notions of immersion and presence and how they relate to task performance is important to study so that customized systems may be built to maximize effective and efficient learning for the least amount of cost. Additional research is important so that virtual 3D systems may be built at appropriate levels of immersion and presence to achieve particular learning goals. As an alternative to quantitative measures, Slater (1999) suggests that a qualitative approach be used to assess immersion and presence.

Methods

The study followed the activities of 18 volunteer students, 13 male and 5 female ranging in age from 18 to 36, as they took part in a designed learning activity using computer games. The participants were self-selected by answering an email or flyer posted on the campus of a 4-year state university. Students were scheduled at 2-h intervals, one at a time. The instructional exercise and data gathering took place in a dedicated laboratory space. Participants played a total of two games for 1 h apiece from two different genres—the first game being a "seek-and-destroy" type (also referred to as shoot 'em up or kill-or-be-killed) whose sole purpose was for entertainment, the second game being one designed explicitly to teach from the genre of "adventure" type (also called puzzle games or interactive narratives).

Different genres were chosen so that findings would apply across types of games. That is, different genres would allow for a broader range of findings that can be applied to educational games designed within those content areas. The learning activity with the educational game was designed to teach poetry by improving skills in reading comprehension, character analysis and critical thinking using an established protocol through which significant learning outcomes have been previously verified (Scoresby et al. 2006). Desktop computers were used for the study due to their accessibility and prevalence within formal learning environments. See Figs. 1, 2 and 3 for screenshots of each game from first-person, third-person and "without" viewing perspective, respectively.

The protocol followed a sequence of stages: (1) playing a non-educational game, either text-based, first-person perspective or third-person perspective; (2) post-regular game play interview; (3) playing a version of the educational game, either text-based, first-person perspective or third-person perspective *but a different perspective than from stage* (1); and (4) post-educational game play interview. Requiring participants to play games while switching perspectives allowed the researchers to gain more data such as how this particular perspective

Fig. 1 Screenshots of games played in 1rd person perspective, *Unreal Tournament 2003* (Epic Games and Digital Extremes 2003) and *Voices of Spoon River 3D* (Stowell et al. 2006)

Fig. 2 Screenshots of games played in 3rd person perspective, *American McGee's Alice* (Rogue Entertainment 2000) and *Voices of Spoon River 3D* (Stowell et al. 2006)

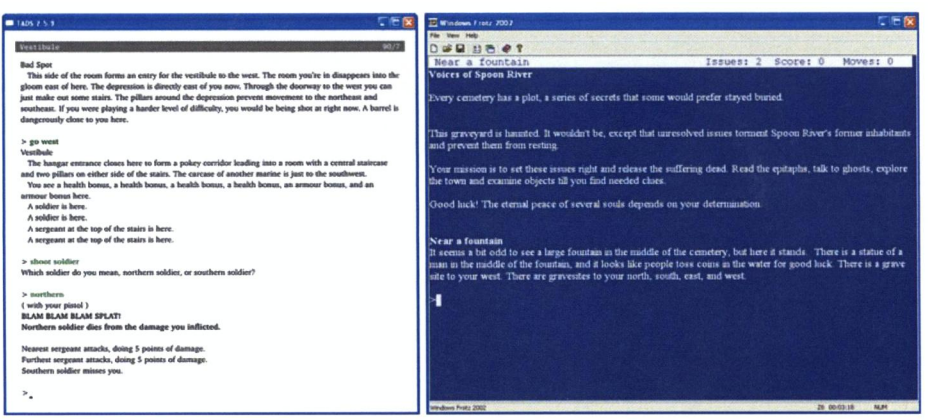

Fig. 3 Screenshots of games played without visual perspective, the text-based games of *FOOM* (Johnson 1996) and *Voices of Spoon River* (Stratum 2006)

affected the players' experience and how players' feelings of presence and flow were influenced. The interview questions centered on how and if players felt presence and a sense of flow during game play, and what they learned about the poetry experienced in stage (3). The reason for starting the players with a non-educational game was to create a baseline of data from more commonly experienced computer games. After non-educational game play in stage (1), the players were interviewed to establish data with regard to senses of presence and flow. Following the interview the participant then played a version of an educational game and was interviewed an additional instance. The baseline data assisted in a comparison of responses between different players for games of different perspectives, and for comparisons between game genres. The questions after stage (3) offered information about whether or not the participants could reach a sense of presence and flow during the playing of a specific educational game and how presence and flow impacted learning in this context.

Questions, as seen in Fig. 4, were added to the protocol during the learning activity and the post-interview to assess the students' perceptions of the immersive quality of the system. The questions for presence were based on Slater's definition of immersion (1999) as stated earlier and probed the extent the system's fidelity related to the students' sense of the environment, how well the virtual 3D objects represented real-world objects, and how independent dynamics of the virtual objects such as animation, light, and shadows impacted the senses. Questions based on Witmer and Singer's (1998) presence questionnaire were also added to the protocol during the learning activity and post-interview and were specifically designed to draw out responses aimed at the participant's sense of presence. Using Slater's components of presence (1999), modified to include virtual learning environments as described earlier, the questions were designed to elicit the user's feeling of "being in the environment." The questions were also formulated to elicit whether the students remembered the virtual 3D objects as existing in the environment rather than being computer-generated objects on a display. The questions for flow were based on the definitions and characteristics of flow as described by Csikszentmihalyi (1988). Questions were developed similar to the Jackson and Marsh (1996) Flow State Scale.

Presence

1. Describe the environment of the game.
2. What did you notice about the environment around you (sounds, people...)?
3. Describe your feeling of control of the environment, was it natural?
4. Describe your awareness of the controls you were using?
5. In what ways were your senses engaged?
6. Describe any delays you experienced between your actions and the outcomes?
7. How well were you able to focus on the activities of the game (...and not the controls for those activities)?
8. Describe the environment in terms of "reality." (presence and flow)
9. Do you have feelings of presence (...from this visual perspective)?
10. Describe a situation when you might have felt as if you were the character in the game.

Flow:

1. Why did you (...any particular gaming/learning activity)?
2. What was the tone of the game?
3. How long did it feel like you spent playing the game?
4. What was your purpose within the game?
5. Describe issues or feelings of concentration/focus.
6. Describe your awareness of me/self.
7. As your ability within the game improved, describe any changes in awareness of your environment (if any).
8. Could you feel yourself getting more "involved" within the game?
9. Describe your motivation for your activity within the game (...elements of "fun").
10. Describe any emotional thoughts during gameplay. (presence and flow) Do you feel the reality of action made any difference in your activities?
11. What sorts of challenging activity did you encounter?
12. Describe your interest in the subject matter of the game. Describe any thought of uncertainty, or attempts at attaining goals within the game.

Fig. 4 Sample questions of the post-activity interview

Data sources and analysis

Data were collected from the pool of 18 students taking part in the instructional exercise. Each learning exercise was designed to take approximately 45 min, plus 15 min to administer the informed consent forms and post interviews. The data was extracted from videotapes of participants during game play, post interviews and researcher observations and field notes. A typical participant began the protocol by completing informed consent paperwork, playing an assigned shoot 'em up game, being interviewed about their game play, playing an educational game and being interviewed about their game play once again. Analysis of the interviews provided insight on what the student learned as a result of the instructional exercise, as well as the students' cognitive states during the exercise.

The participant interviews, as well as game play activities, were videotaped, using techniques commonly used in support of videotape analysis (e.g., Jordan and Henderson 1995; Goldman et al. 2007). For example, videotape was reviewed noting timestamps and a written description was created of activities that may have shown characteristics of presence. Once completed, the actions viewed in the videotape were then compared to the descriptions the players gave in the interviews. For example, during the video analysis of Sandra playing *Unreal Tournament 2003,* it was noted that her emotions were being affected during game play. A physical manifestation of her emotions was observed when her character was killed, and she repeatedly and impatiently clicked the computer mouse to ensure a quick regeneration into the virtual world. This observation was compared to the answers she gave in her interview when she explained that she was "mad" and "wanted to get back into the game quickly to get revenge" on the character that killed her. These findings were then categorized and grouped with other data (e.g., observations, interview answers) that related to emotion, motivation, and presence. This process was repeated with each participant until there was no change in the occurring themes. As shown, and later discussed in Table 1, the analyzed data was put into the categorical perspectives in which they occurred.

The comparisons between game play actions and self-reported data were used to identify qualities of presence and flow during the learning activities to link them with student learning strategies. As seen in Fig. 5, the qualities of the immersive technologies were manifested in head and body movements and other physical reactions to the way virtual 3D objects were represented within the system. The head and body movements were manifested more often by those who played the high impact, fast-paced, first-person perspective game than those who played the other perspectives or even the educational, slow-paced, first-person perspective game. Three of the six players that played the first-person perspective game *Unreal Tournament 2003* showed head and body movements while playing. However, some head and body movement was observed in two of the six players that played the entertainment third-person perspective game *Alice*. Evidence of presence was indicated by the students' responses to events based on the nature of the virtual objects rather than events based in the real environment. A further videotape analysis was used to identify previously unidentified qualities of flow and presence to be linked with desired learning outcomes. The responses to the questions during the game play were used in tandem with the videotape analysis results to help identify patterns that link students' presence and flow with specific learning strategies. The results of the study are reported through specific examples of participant activity and narrative (see Guba and Lincoln 1983; Strauss and Corbin 1998), along with summative findings and impacts for future research.

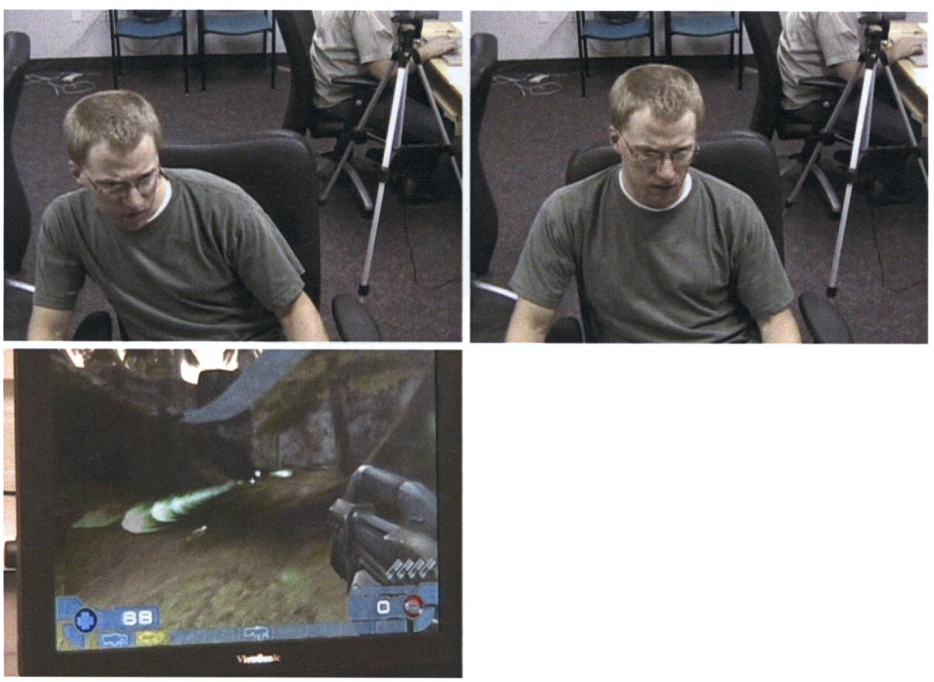

Fig. 5 The qualities of the immersive technologies were manifested in head and body reactions to virtual 3D objects. While being shot at, "James" dodged right and then returned to normal playing position when out of danger

The interview questions gave participants an opportunity to not only answer the questions, but to also reflect on their playing experience. Some answers were short like, "Yes, I felt like I was there." Some answers were more verbose, including descriptions of what it felt like to "be there" and what the player was feeling at that time. Even though the interviews were scheduled for 15 min, the actual interviews lasted anywhere from 5 min to 1 h. One player felt ill and interviewed for only a few minutes whereas another player was excited to talk about what he experienced and talked for 1 h. The longer interviews allowed for deeper insight into that player's experience. Pairing these answers with the players' filmed body actions provided connections between presence, flow and perspective. An additional layer of analysis of these connections helped identify how perspective influences feelings of presence and flow during participation within the learning games. For example, those that played the first-person perspective game tended to move their head as if to get a better view or to dodge bullets. Post-game interview questions provided the basis for what students learned during game play, associated with aforementioned goals of reading comprehension, character analysis and critical thinking. At least one of the instructional games used in this study has been used in middle-school English classes. Learning objectives such as reading comprehension, character analysis, and critical thinking were assessed in the English class through essay writing and class discussion. The research interview questions allowed the participants to answer questions that were designed to assess their knowledge of topics based on the learning objectives in ways consistent with the English teacher's methods for this particular unit. Notes were created on material learned through the exercise and then compared with similar notes from a study

focusing on learning with the same game (Scoresby et al. 2006). Comparing notes in this way would allow for any anomalies in learning strategies during game play to surface.

The procedure of analyzing the interview data consisted of finding and matching similar answers to questions and grouping them. Groups of answers led to similarity characteristics. As the grouping continued, four categories of characteristics emerged as dominant and inclusive during the analysis. Once these categories were revealed, the video was again analyzed to see what the players were doing during the time described and what game they were playing at that time. This analysis allowed comparison of action and game type within the emergent categories.

Findings

Although flow and presence have different cognitive properties as described within our definitions, they also have similarities as far as how students in this study experienced their game play. Perhaps surprisingly, students made similar progressions within processes or categories of cognitive states within their observed and self-reported activity. First, we report on these similarities as emergent findings within the study. Then the following sections address the effects of viewing perspective within each of the emergent cognitive states, many of which are dissimilar in how people progress to states of flow and presence. The final section addresses the differences between learning-type game activity and the influences viewing perspectives may have on flow and presence with respect to what students learn.

Emergent categories

While analyzing the data to find how perspective affected feelings of presence and flow, four primary categories emerged that affected players' experiences with reaching these states. The categories are content, emotion, motivation, and engagement. The players in this study who did not feel presence nor flow provided evidence that they did not experience nor connect with one or more of these categories.

The following sections present the results within the emergent categories that led to feelings of presence and flow. Through analysis, these categories emerged to answer the following research question:

- What emergent properties are of greatest influence on presence and flow, given (in light of) these different viewing perspectives?

Content, emotion, motivation, and engagement

As categories of content, emotion, motivation and engagement emerged, it is important to note that the process to reach presence or flow also revealed itself for the players with little or no gaming experience. Experienced players sometimes skipped content and emotion and started with motivation because their experience allowed them to know what they liked. Inexperienced players who reached presence or flow tended to follow the process from content to engagement more closely. For inexperienced players, content is the first category that influenced their ability to reach presence or flow. Players who did not like the content of the game, reporting it as being "too violent" or they did not like the actions performed within the game, rarely progressed towards feelings of presence and flow. However, those who liked the content of the game progressed through the categories to

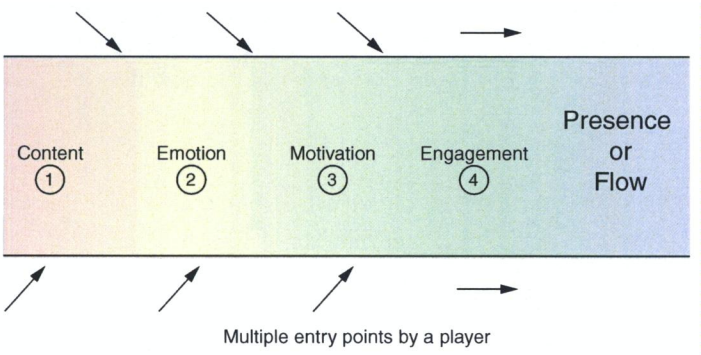

Fig. 6 There is an implied process to presence and flow found in the emergent categories. If a player enters at 3, then 1 and 2 exist or have been experienced. Perhaps unique, a player's process to presence and flow is not hindered by categories 1 and 2 (e.g., experienced gamer)

feelings of presence and flow. Often those who liked the game content also indicated an emotional experience or connection with the game. Some became angry with non-player characters (NPC) while some players felt empathy and wanted to help. These emotional connections were often used as motivation for the players to continue playing by seeking revenge on the NPC in the shoot 'em up games or helping others in the adventure/educational game. Moving through this process, the players then had an easier time becoming engaged with the game. Players' focus and desires were aimed at the game ("within the game") and almost nothing else. Therefore, engagement was found to be the most important factor for the players in this study to reach feelings of presence or flow. At the same time, for the inexperienced player, the evidence suggests that each step of content, emotion and motivation was experienced before reaching a level of engagement. When a player liked the content, had an emotional experience, and was motivated to play the game, engagement was the end result. As shown in Fig. 6, inexperienced players experienced all four categories when they reached feelings of presence or flow.

Content

Categorically defining content and genre is a bit problematic because they are similar in many ways. The game's content (actions within the game or the type of game) is the first category an inexperienced player faces to reach presence. The genre of a game is determined by the characteristic actions performed within the game. For the purpose of this study, content is defined as the actions performed in the game, the context aspects that make up the game such as environment or sounds, and level of difficulty of content activities. Therefore, the characteristic actions that make up the genre are contained within the entire makeup of game content actions. During the interviews, players were asked to describe what they liked and disliked about the games. In one case, a player stated that she did not like the shooting or killing actions of the game but did like exploring the environment, the different terrains, and the finding of items. When players disliked the type of game they were playing (e.g., *Unreal Tournament 2003*) and characteristic content they would not progress to the next category. If the game content is disliked by the player, then there seemed to be no reason or motivation for the player to play. People play games for entertainment, to do things that cannot be done in real life, or to learn (Crawford 1997; Paras and Bizzocchi 2005). The analysis from this study showed that personal interest

shaped the desire to play. If the content does not match personal interest, then players will not have a desire to play the game. Those who liked the content of the game had a much easier time moving through the categories to presence and flow than those who did not.

Emotion

Baños et al. (2003) state that emotional experiences allotted for or led to high levels of presence because players in different ways became connected to the game or the characters in the game. The players felt empathy for, frustration towards, a desire to get revenge upon, or sorry for the characters within the game. Getting to this point meant the players had moved past the content category and were involved enough with the game that they could forge an emotional connection that then pushed them towards the next category—motivation.

Motivation

According to Crawford (1982), learning is the primary reason people play games, but secondary reasons include an escape into fantasy and a desire to prove oneself. Crawford claims that players need to be motivated to play games first, and then the game can become entertaining. The inexperienced players in this study showed that to a certain degree they needed some extrinsic motivation to play. The extrinsic motivation was provided to these players in the form of a reward. Once they were playing the game, the inexperienced players had to find something intrinsic that motivated them enough to continue and to be successful or "win." For the inexperienced player, extrinsic motivation came before content and emotion along the path to presence and flow. However, those in this study both inexperienced and experienced gamers who did not like the content or establish an emotional connection rarely found intrinsic motivation. These participants did not care about what happened next or what their purpose was within the game. In contrast, those who liked the content and had an emotional connection used these feelings as motivation. Empathy for the NPCs made some players want to help, and seeking revenge against specific NPCs drove some players to work harder for success. This motivation pushed these players to become more engaged with the game. More thought and effort were focused on the game and the purposes within the interactions. Experienced players often, but not always, skipped the content and emotion steps in the process to presence and flow by relying on past gaming experience to inform them of what they liked and disliked (see Table 1). One experienced player stated he enjoyed playing games with puzzles and that is why he liked playing *VOSR 3D*. He also stated that he felt somewhat present while playing the game showing that he skipped content and emotion. However, another experienced gamer revealed that he did not care for the shooting game because there was no challenge for him. He stated that he did not have feelings of presence because he was "bored" while playing and was not motivated to play against the computer. More likely, this player did not proceed to presence and flow because he did not enjoy the level of challenge of content activities of the game and therefore never achieved a state of being intrinsically motivated.

Engagement

When a player is interested in a game and wants to keep playing, that player is *engaged* (Brown and Cairns 2004). To reach a level of engagement, the analysis indicated that the player had to move past the preceding steps. To get to the point of engagement, the player

must like the content, have some type of emotional connection, be motivated to succeed, and not be distracted by things such as the controls of the game or distractions in the external environment. The player must also become familiar enough with the game that he knows things such as what the capabilities of his character are, the available weapons or tools, and what his or her purpose is within the game. The players in our study showed that they were comfortable with the game controls either because of past experience or because they learned to use them relatively quickly.

The analysis revealed two different kinds of engagement for the players. The player engagement depended upon the type of game that was being played. The shoot 'em up games were faster-paced games and required a higher level of interactivity. The players who had previously played these types of games, particularly the first and third person perspective games, had to interact with the game at a faster rate than the other adventure/ educational games because it was kill or be killed. Players who played the adventure-educational games still interacted with the game, but not at the same rate or intensity as the shooting games. Because adventure-educational games are slower in nature, the players' engagement differed. Players of the adventure-educational games used skills like critical thinking and problem solving, whereas the players of the shooting games played to "stay alive."

Case exemplars

The fast-paced interactions and high quality graphics of *Unreal Tournament 2003* allowed some players to become engaged more quickly than players of other games. The interactions showed that students' engagement with the game required more attention be given to what was happening in the game than what was happening externally in the room and were consequently focusing only on the game. In one example, before Jared started to play, he mentioned that he liked shoot 'em up kinds of games. Jared's past experiences allowed him to take the first step towards engagement because he already knew he liked this type of game and the content within it. This step towards engagement can be seen in Table 1 and compared with the other perspectives. While playing, Jared started to become frustrated and wanted revenge against the NPCs. He often showed his emotions when he succeeded in killing an NPC or when he was killed. When asked why he kept playing, he said he wanted revenge on the players that killed him. Along with having fun, Jared was motivated by revenge. His motivation allowed him to become engaged with the game to the extent that he said there was no reason to focus on anything past the edges of the screen because the action was on the screen.

In another case, Sandra had a similar experience with *Unreal Tournament 2003* although it took her longer to become engaged with the game than Jared. She was not familiar with the controls nor the content and had to take some time to familiarize herself with both. She said, "It's a little awkward because I'm not used to controlling gaming with a mouse..." After playing for a 5 min, she said that she gained familiarity with the controls and focused on the game instead of the controls. Sandra became more involved with the game and, like Jared, wanted revenge on the other NPCs. Using revenge as motivation, Sandra also started to investigate the environment to see where she could go and what she could find to be more successful. After finding game play success, she started to focus more intently on the results of her in-game actions. She reached the point, "I was more concerned with killing people than with what was going on externally." Sandra was engaged with this game to the extent that it started to affect her physically. When she stopped playing, she noticed that her body was tense to the point of discomfort. When

discussing feelings of presence and how her senses were engaged, she stated that she wished that the game had surround sound because "it probably would have taken me completely into the game."

Alice played *VOSR 3D* and had a much better experience with this game than she did with *Unreal Tournament 2003*. From her statement, the process she followed was indicative of reaching engagement. "I liked the game. It was slower and I could take my time, and I liked it because it was more puzzles and not kill everything in sight...I did want to help the ghosts and help make them happy." While playing *VOSR 3D*, she progressed through the game because she liked the content, she was emotionally connected to the ghosts and wanted to help them, she was motivated to find out what to do to help them, and she wanted to continue to discover all areas and items within the game. Even though Alice did not like playing *Unreal Tournament 2003,* she still showed physical signs of presence by trying to "look around" virtual obstacles within the environment.

Jared did not like *VOSR text* at all. When asked his opinion of the game, he said he thought it was "boxy." Perhaps he did not like the game because it is a non-graphical game, but player analysis indicates that other players who were experienced in graphics-based games, enjoyed playing *VOSR text*. Kathryn, for example, enjoyed playing the text-based game and enjoyed discussing her experiences with it. Initially during her game play, she read the text without interest, but as the story within the game started to gather interest for her, she began to read with a purpose. When asked what it felt like to be the character, she discussed how sad she felt for the NPCs in the game. Kathryn moved beyond the content step to emotion. The emotional connection motivated her to continue. She did not finish the game during the time allotted for research, and during the post-exercise interview, she asked if she could have a copy of the game because she wanted to finish it.

Julie was bored playing the text-based shoot 'em up game. When asked what she did not like about the game, she simply stated, "...the subject matter more than anything." During game play, Julie lowered her head many times and let out big sighs. Observing Julie's actions, as seen in Fig. 7, and hearing her vent frustrations was indicative that she was not "in the game" or progressing beyond content.

Fig. 7 "Julie" leaning back in the chair showing boredom and being disengaged because she did not like the content of the game

Perspective, presence, and flow

The analysis indicated that perspective was not as influential on reaching a state of presence and flow, contrary to assumptions from previous research. The following section discusses perspective and its influence on presence and flow to address the question:

- How does the viewing perspective of the player impact his/her feelings of presence and flow?

Presence

The analysis of presence included the sense of "being there," responses to events that occurred in the computer environment, and the learner's memory or knowledge of objects in the virtual environment. The gaming environment and the external environment are both experienced through our senses, but not necessarily consciously attended to at the same time. What one sees and hears influences the ability to reach feelings of presence during computer game play. Figure 8 shows that the gaming and non-gaming environments are experienced through the senses (e.g., sight, sound, and touch), which contain elements that can act as distracters. The analysis indicated that the visual and audio aspects of the game certainly helped some players reach feelings of presence. Other players disliked what they saw and heard and were distracted. Relating to the category of *content*, players who liked what they saw and heard progressed through the categories toward presence. Those who disliked what was seen and heard either did not progress towards presence or had a difficult time doing so. Also, some players heard or saw things external to the game that caused them to become distracted from the game, which blocked their progress toward presence. Touching the keyboard or mouse was not a significant influence in adding to or detracting from the feeling of presence. However, learning how to control the game did serve as a common distracter. When a significant amount of thought went into using the controls, the players could not focus on the game and they could not progress toward presence. When the controls of the game and the action of the character were not fluid, it was similarly easier for the player to become distracted.

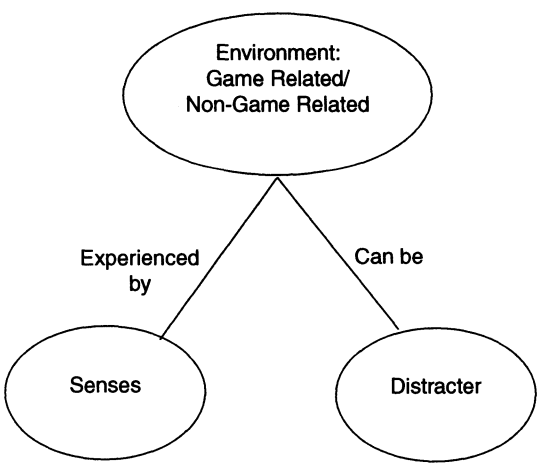

Fig. 8 The gaming and non-gaming (or external environment) are experienced by senses, and can be distracters that will not allow players to become engaged

The interviews helped explain how perspective had influenced the players' feelings of presence. First-person perspective allowed the player to "become" the character. In first-person perspective, the player is holding the gun or walking through the cemetery. In third-person perspective, the players are following the character and watching what is happening from a distance. By playing third-person perspective games, the player is already removed to some degree from the character, but feelings of presence are still reachable. Text-based games force the player to imagine what the environment looks like based on a description. In text-based games, however, the wording is mostly in first person, which helps players to feel like they are personally involved. The following examples show how perspective influenced some of the players' feelings of presence in this study.

First-person perspective

Not everyone who played the first-person perspective games felt presence, but a higher number of players reported they felt presence with this perspective than from the other perspectives. Those who reported feelings of presence reported being influenced by the graphical nature of the game, because (1) they were placed in the role of the character and (2) they did not have to see another character to connect with (like they would in third-person). To help clarify, one player stated the following when describing *Unreal Tournament 2003*:

> Well, at first-person you see the appendages going, you see the gun you know it's attached to your arm, and when you move, your actual arm moves, or you move the mouse—you are moving on the screen too. So, you begin to lose the separation between avatar, for a lack of a better word, and yourself. You just kind of meld into that character, it's almost an extension.

Some players did not progress toward presence with this perspective because they did not like the game content, especially "killing." Some of the female participants stated they assumed the character was male and that they could not feel presence while hearing a male voice "grunt" when being shot. Findings based in part on these examples are compared with the other perspectives in Table 1.

Third-person perspective

Third-person perspective influences feelings of presence in some manners that are similar to first-person perspective, such as seeing a graphical interface and fluid non-distracting character actions. However, third-person perspective influenced players in ways that inhibited their feelings of presence. Some players progressed through the four categories toward presence despite finding that the character-player provided some visual occlusion to the virtual environment. This visual occlusion became somewhat of a distraction. In other ways, players reported feelings of controlling a puppet instead of a "being" a character in the game. In additional cases, gender differences may have prevented feelings of presence. Some male players reported they could not connect with the female player character in Alice, and some female players reported a disconnection with the male character in *VOSR 3D*. Players who did not express any problems relating to "being" the character said they felt as if they were following the character. Players reporting the following phenomenon still felt like they were "in the game."

Without-viewing perspective

The text-based or without-viewing-perspective games influenced feelings of presence in different ways than first and third-person perspective. Those who had previously played text-based games were familiar with the navigation jargon and how to progress through the game. These players could more easily imagine the world they read because they did not have to focus on the controls or determine the purpose of the game (see Table 1). They also had high levels of anticipation during game play because they knew that action-response cycles occurred the moment they hit the "enter" key, especially during the text-based shoot 'em up game. Text-based games allow for reflection during game play between turns. When players reflected on their actions, or what they were about to do in the game, they often became more involved in the game. Because of the first-person perspective narrative of the text, some players more easily put themselves in the position of the character. One player, when reflecting on the environment and how believable she thought it was, stated: "Your imagination made it real, because you were able to read it, you were able to think about what you were supposed to be doing while you were there, and that is what made it believable." On the other hand, the text proved to be distracting for some players and prevented them from imagining the environment with themselves in it. When the game produced confusing or confounding textual feedback to player actions, some players had a hard time imaging the described game environment. Players found it difficult to imagine themselves in the environment with a virtual (described) object and would therefore not have feelings of presence with that object. The nature of the text-based games is also a distracter in itself. Because there are no graphics, players often draw maps of the locations they explore and the items located therein. Pausing to draw took players away from actively imagining the environment, brought them back into the "real" environment, and away from feelings of presence.

Perspective and engagement

A portion of analysis compared the different perspectives and players' progress towards engagement. Table 1 describes players' progression through the different categories by

Table 1 Comparing progression towards engagement and perspective

	Content to emotion	Emotion to motivation	Motivation to engagement
First-person perspective	More dependent on personal preference Content/actions possible distracter for progression	Content important	Personal preference Possible gender difference
Third-person perspective	Dependent on experience and personal preference Character possible distracter for progression	Content important	Personal preference Possible gender difference Ownership of character and activity, could or could not relate to character
Without-viewing perspective	More dependent on past experience and personal preference Learning the controls was a large distracter/hinderer for progression	Content important Personal preference dependant	Personal preference Rare gender differences

perspective. Categorized data showed that for both inexperienced and avid gamers, personal preference was highly influential in the progression towards presence and flow. The graphical games had a higher rate of interaction, which required higher levels of focus and use of cognitive faculties. Within this study, the graphical games engaged more players than the text-based games.

Presence and engagement

Most of the players in this research self-reported that they experienced engagement to some degree. Table 2 shows that engagement is important to attaining feelings of presence. Table 2 offers observational analysis and players' self-reporting of becoming engaged and reaching a state of presence. All but one participant self-reported that they matched the observed signs for engagement and presence. The researchers observed physical manifestations of motivation and engagement while the player was playing the game. As shown in Fig. 8, self-reports or observations of boredom were indicative of "no motivation to play." An example of how players showed motivation and engagement was by speaking out loud to non-playing characters while playing the game. Some players exclaimed statements like "I'm going to get you." Table 2 articulates how strongly related engagement was to presence for our participants.

Flow

Even if a player does not have feelings of presence, it does not mean that player cannot or will not reach a state of flow. As seen in Fig. 9, and consistent with observations by Csikszentmihalyi (1988), when someone is in a state of flow she often experiences a loss of sense of time, loss of self-awareness and the environment, and a heightened ability. When a player is distracted enough, he or she will not reach a state of flow. Beyond not progressing through the categories, some distracters include components in the external environment that make noise, a process of learning the controls of the game, or a progressive game that proves to be too challenging. During game play, some players reached a state of flow where they experienced a loss of awareness, loss of time and above-average ability. Like presence, players had to progress through the four categories to reach a state of flow. Different from presence, the state of flow was achieved based on the activity and actions of the players. For example, Jared stated:

Table 2 A matrix of relationships between presence and engagement

	Motivated to play (observed)	Engagement (observed)	Self reporting of presence
Foom text	$X_2\ X_7\ X_8$	$X_2\ X_6\ X_7\ X_8$	$X_6\ X_7\ X_8$
VOSR text without	$O_{11}\ O_{13}\ O_{14}\ O_{18}$	$O_{11}\ O_{13}\ O_{14}\ O_{18}$	$O_{11}\ O_{13}\ O_{14}\ O_{18}$
Alice 3rd	$X_3\ X_9\ X_{11}\ X_{14}\ X_{16}\ X_{18}$	$X_3\ X_9\ X_{11}\ X_{14}\ X_{16}\ X_{18}$	$X_3\ X_9\ X_{11}\ X_{14}\ X_{16}\ X_{18}$
VOSR 3D 3rd	$O_1\ O_5\ O_6\ O_{17}$	$O_1\ O_5\ O_6\ O_{12}\ O_{17}$	$O_1\ O_5\ O_6\ O_{17}$
Unreal tournament 2003 1st	$X_5\ X_{10}\ X_{15}$	$X_1\ X_5\ X_{10}\ X_{12}\ X_{13}\ X_{15}$	$X_1\ X_5\ X_{10}\ X_{12}\ X_{13}\ X_{15}$
VOSR 3D 1st	$O_4\ O_7\ O_8\ O_9\ O_{16}$	$O_3\ O_4\ O_7\ O_8\ O_9\ O_{16}$	$O_3\ O_4\ O_7\ O_8\ O_9\ O_{16}$

$O_{player\#}$ = educational game

$X_{player\#}$ = non-educational game

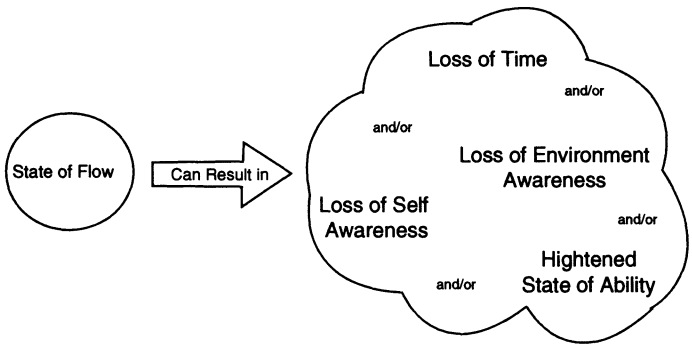

Fig. 9 Cognitive states resulting during flow (derived from Csikszentmihalyi 1988)

> ...when I was playing the game, nothing else mattered. I mean I wasn't thinking like "oh man I have work tomorrow"...but when I would die and I'm like I'd get mad and I would come back in my chair and not be touching the controls anymore and think "I wonder how long I've been playing?"

Jared's statement shows how his actions of playing the game created an experience where he lost awareness of himself and the amount of time spent during his activity.

First and third person perspective

Perspective did not play a large role in reaching a state of flow, however, some factors were found to be influential. If the player has already moved through the four categories, reaching a state of flow was possible, but not guaranteed due to distracters within the gaming and external environment. A large part of reaching flow is focus and what garners the lion's share of attention (Csikszentmihalyi 1988, 1997). If a player's focus is somehow taken away from playing the game, the state of flow is disrupted. A player's focus may be disrupted by distractions in the external environment, an overly challenging game, or "shocks" during game play. Shocks include things that happen in the game that are out of place, such as when a graphic does not appear as expected or when a player dislikes something within the graphic elements (McMahan 2003). For example, in our study, a player did not like how the horizon was empty in *VOSR 3D*. A feature of the virtual environment seemed so unreal to him that he could not focus on what was going on in the game—his attention was continually pulled toward the "missing" horizon. One factor relating to flow and specifically to first-person perspective was how some players felt as if they were acting as the character in the game. As this primary character, they had a purpose, something to solve in the narrative. In third-person perspective, the character the players controlled (sometimes thought of as a puppet) had the purpose, not the players themselves. Without a sense of purpose, those who played third-person perspective games had a more distracted sense of focus than those who played the first-person games, and fewer reached a state of flow.

Without-viewing perspective

The state of flow was not as easily reached in the text-based games as it was with the graphical games. Some players were distracted from their task, feeling as if there was "extra work" related to imagining the game environment. Some were too distracted by

external activities, such as drawing a map to navigate the virtual space, and they felt that they were "coming in and out of the game" for that reason. Others could not figure out what to do by reading the text, so they became bored and disengaged with the game. However, the factors that invoked motivation and engagement in the graphical games also applied to the text-based games. If players enjoyed the content and type of game, they could reach a state of flow. For example, while Trevor was playing *VOSR*, he reported he became more involved as the game progressed, finding artifacts and talking to the ghosts. He began to see relationships between characters within the game and how in-game elements worked together to form a narrative. When asked if the game was fun, he stated that it was fun until he reached a point when he did not know what to do. He reported and showed signs of reaching flow, until he reached this dead-end.

Learning

Perspective, presence, flow and learning

How learning is affected by perspective, presence, and flow was also investigated. The following question guided this portion of the research:

- What, if any, are the links between learning strategies, presence, and flow in a designed learning exercise using computer games with different viewing perspectives?

In the study *Features of Virtual Environments that Contribute to Learners' Understanding of Earth Science,* Winn et al. (2002) found and described what successful students did during an educational activity within a virtual environment. In their study, successful students reached the final objective by solving the problem within the virtual environment. The most successful students:

- were more systematic in their control of variables, the extent and nature of their observations, and their cross-checking of their observations from different points of view;
- were more animated and active in the VE; expressed more affect, mainly positive;
- used more of the virtual tools;
- engaged in more comments on their progress—showed more metacognitive awareness;
- had less difficulty using the interface;
- and were more physically active while visiting virtual environments.

Even though the players in this study did not exhibit all of these actions, the students who experienced states of presence, flow, and demonstrated evidence of reaching the learning objectives within the educational games showed some similarities to those actions in the list. Comparing the actions by players in this study to those listed above helped inform if and how students were considered "successful" through a comparison of different viewing perspectives. Post-activity interview transcripts were also compared with notes from previous studies that used the games in learning activities. The comparison was used to check for consistency of experiences by participants. The learning objectives of the *VOSR* games are to see if a player can resolve the issues of the ghosts by using reading comprehension, character analysis, and critical thinking skills.

First-person perspective in VOSR 3D

Carla's experience with *VOSR 3D* was much more positive than with *Foom*, the shoot 'em up, text-based game. She became engaged with the *VOSR 3D*, showed motivation to play, and

verbally expressed her high levels of enjoyment. When asked test-based questions about *VOSR 3D* to explore what she learned, she answered the questions correctly and elaborated on most of them. Carla reported that she is not much of a computer game player, and did not progress as far in the game as many of the other players did that had more gaming experience. Nevertheless, she had few distractions that kept her from reaching states of presence and flow and successfully learned much of what was intended from game objectives. She reported she felt comfortable with the controls of the game and was not distracted by them. She also mentioned how she felt like she, as the character, wanted to be the one helping the ghosts.

Bill, on the other hand, reported a significant amount of previous game experience and displayed good game problem-solving skills. He resolved the issues of the ghosts within *VOSR 3D* but did so by guessing. As for the attributes needed for a successful learning experience, he said the environment was fine but that the controls were confusing. Even though he self-reported that he had some feelings of "being there" and that he was engaged enough to reach a small state of flow, he said it was not that fun for him to play. He thought it was "kind of cool" to solve the puzzles because he likes to problem-solve, but that in itself was not enough to be enjoyable. The actions within the game were hard for him to master and therefore distracted him from caring about the ghosts and their issues. When asked about character analysis and critical thinking, he did not really have the answers because he was distracted by the content, actions within the game, and the controls. He did not learn what was intended by the game's designers.

Third-person perspective in VOSR 3D

Alice became engaged and was motivated to play the game, and mentioned repeatedly how much she wanted to continue to help all of the people of Spoon River. She was a successful learner, correctly analyzing the game's characters and understanding what they were saying within the game context. Alice used critical thinking to resolve character issues to help progress in the game. Alice said, "To me this was more interactive because you had those puzzles and you had to first pick something up and use it. It was more than just shooting things. You had to think, 'What do I do with this piece?'... I felt like I was in control. In the other game I did not feel like I was in control." Alice's experience is supported by Winn et al.'s steps of being more active and using the tools within the environment. Alice's emotional connection to the ghosts and wanting to resolve their issues within the game helped her progress to motivation and engagement, thereby increasing her time on learning-related tasks.

Brian had more gaming experience than Alice, but did not learn everything intended in the game. He resolved two in-game challenges by using problem solving skills, but he did not know the reasons why they were solved. Brian may have been distracted by the controls and the perspective of the game. In third-person perspective, he said that he felt like he was "controlling a puppet" and that he had to find out what the character within the game needed to do—not what he, as the player should do. Because Brian did not like the controls or the perspective, he did not progress and become engaged like Alice did. Brian put little effort toward understanding what the in-game character issues were and how to resolve them. He only succeeded in game progression because he employed trial and error, but did not learn what was intended by game designers.

Without-viewing-perspective in VOSR text

Because a text-based game is a without-perspective game, it is somewhat difficult to compare the successful students who played VOSR with the characteristics of successful

learners in virtual environments. Successful students in this study cannot be compared with regard to many of the listed elements, but some of them do apply.

Trevor played VOSR and was successful in learning many in-game lessons. He was systematic during game play by exploring the environment to determine where he could go and what he could do. As Winn et al. (2002) describe, being systematic enabled Trevor to be more active in the game. Having control of the environment helped Trevor to be successful because he was not distracted by the controls of the game. Players who experienced difficulty becoming familiar with the controls often became confused and frustrated with the game and often lost interest, but Trevor enjoyed his experiences in solving the puzzles and seemed unaffected by the type-driven interface. Feeling sorry for one of the in-game ghost characters, Trevor was intent on helping the ghosts in need. Like other players, Trevor progressed through the categories toward flow and was also successful in completing many of the learning goals of the game. He understood what the text was saying about the ghosts and their issues, and he correctly analyzed the characters to learn what was needed to help them.

Sandra did not progress beyond the "content" stage while playing and had no feelings of presence and flow, which also affected her ability to complete learning activities within the game. One of the major distracters from her engagement was that she never felt like she had good control of the interactions taking place within the game. She could not navigate like she wanted and therefore could not gather the information to be successful. She started to randomly perform in-game actions, like giving things to the ghosts and found that one ghost wanted a fiddle. She did not know why the ghost wanted the fiddle, she just remembered that "someone said something about a fiddle." Because she was frustrated with the controls of the game, her lack of engagement, and her reduced motivation to play, she did not learn what was intended by game designers. She read the text and understood what she read, but did not put the information together with the specific actions needed to resolve the ghosts' issues.

Conclusions

The number of participants involved in this study necessarily limits the opportunities to generalize the findings to a broad range of students in our sample, aged 18–36. However, we observed few differences between male and female participants, with results being more influenced by the past experiences of the player than their gender or age. Consistent with the nature of the methods of data collection and analysis, the findings should also appropriately be considered contextual in their scope. The analysis of the players in this study showed that factors other than perspective were more influential on feelings of presence and reaching a state of flow. These same factors were also more of an influence on the students' learning. These factors can be catalogued within areas of content, emotion, motivation, and engagement.

Engagement

A state of engagement was the most influential and most difficult factor to reach states of presence and flow, because the players needed to first experience elements of content, emotion and motivation. When players had experiences within all of the categories, they had a better chance of becoming engaged with both the learning and shoot 'em up games. The amount of engagement also affected the extent to which players completed learning-based

activities within the game. If a player did not become engaged with the game, she usually did not care about what she was supposed to learn from the game.

Motivation

Motivation, more specifically intrinsic motivation, was important for the students in our study to be engaged and then to reach states of presence or flow. Without motivation, players had a hard time "getting in the game" and would not become engaged. The non-gamers had more obstacles to overcome before they felt comfortable with in-game activities, such as the time it took to reach a level of comfort when manipulating the controls of the game. If and when players failed in their attempts to learn the controls, they usually became frustrated and lost the desire to continue playing. Students who had little experience with problem solving within a gaming environment most often became frustrated when they failed to complete the in-game designed challenges. Not only did the lack of motivation disrupt the progress towards presence and flow, it also negatively influenced their desire to learn.

Emotion

Player emotion was strongly related to the content of the game, dependent on the type of game or "story" and what actions the players took as a part of that story. These feelings helped the player be motivated to solve the challenge, be the winner by having the most kills, or help the other non-playing characters within the game. The emotions the players had during game play influenced the level of presence or flow. And often, depending on the game, the emotions lasted until well after they had finished playing. If the players experienced strong emotions, they were more motivated to play while becoming more engaged with the in-game activities. For example, players became angry while playing *Unreal Tournament 2003*. They wanted to "get even" by shooting the other characters within the game. The feeling of anger became a motivating force in their effort to succeed. Other players felt empathy for the ghosts in the educational games and were motivated to help them resolve their issues. The emotional experience for the players also played a role in their learning. Without some sort of emotional experience, the players did not care about what they were doing and were less motivated—less engaged—by the game.

Content

The content of the game was a critical part in the motivation and engagement of the players. If players did not like the genre, represented here by shoot 'em up or turn-taking types of games, they more easily became lost interest, were not motivated nor engaged. Some of the players reported dislike of the shooting in *Unreal Tournament 2003*, noting it was "disturbing" or just plainly non-entertaining. Players also felt the same way when they played the text version of the shooting game (*FOOM*). For those players who did like the game content, they were more easily motivated to continue game play and often became engaged. The connection between content, motivation, and engagement was most evident when considering the effects on presence, flow, and learning. The players' preference of game style or content led to the possibility of feeling presence, reaching flow, and dictated the number of learning activities completed in the game.

Viewing perspective

In the beginning of this study, the goal was to find the effects of perspective on presence, flow, and learning. The findings indicate that perspective does influence presence, flow, and learning, but perhaps not as much as previously reported. The four emergent categories described in this paper were more influential for identifying achieved feelings of both presence and flow, and were important for a complete articulation of roles for different perspectives within those feelings. Vora et al. (2002) reported that players felt more immersed while playing first-person perspective games, and this led to feelings of presence. Because of the heavy influence of companion computer graphics, the mental strain experienced by their study subjects was decreased and reported frequent feelings of "being present." In this research, the highly interactive levels of first-person perspective also influenced presence and flow. Players who became involved with the game and were not distracted by the controls or external factors had an easier time feeling like they were a part of the game and lost awareness of their external environment.

With third-person perspective, some players had problems feeling presence because they could not relate to the player-character they were controlling in the game. However, some players felt presence in third-person perspective by feeling that they were inseparable companions with the character despite not acting as the character. In some cases, players mentioned that they could not see what the player-character was looking at and therefore could not progress as they wanted in the game environment. The players then became frustrated, limiting their progress toward states of presence and flow. Others felt they had a broader view of the environment and were not distracted with feelings that something or someone was behind them, similar to feelings reported by Taylor (2002).

Players reported feeling presence while playing the text-based or the without-perspective games because they had to imagine the environment from what they read from the text. Other players had a hard time "getting into the game" and reaching a state of flow because of the slower-paced interactions common of text-based games. Text-based games are paced by the player—the player reads the text and makes a decision about what to type next to interact with the game. The players who draw maps while playing these games are commonly brought back to states of self-awareness during those kinds of activities. Players enjoyed the aspect of reflecting and thinking about what they as the player-character needed to do next to succeed. Reflection did not add to presence, but it helped them become engaged and influenced their chances of reaching a state of flow.

Enjoying the content, having an emotional connection with the game, being motivated to succeed by completing challenges, and becoming engaged with the game through interaction gave the players in this study a better chance to achieve feelings of presence and to reach a state of flow. The game's perspective can influence progress towards feelings of presence and flow, depending on the players' personal preferences. When game designers are sensitive to the cognitive requirements placed on the players (not distracting players with complex character controls and giving opportunities for players to reflect and think about what they are doing) reaching flow or feeling presence can be more easily achieved.

Discussion

This research was couched using the following definitions: *immersion*—the extent to which the computer system delivers a surrounding environment; and *presence*—the feelings or sense of "being there." The findings are based upon an *immersive level* provided by

desktop computers. Had the participants of this study been fully immersed within a virtual environment, it is possible the levels of engagement, presence, or flow may have been different. For example, multiple study participants stated how they wished there was either surround sound or additional sound effects throughout the environment to enhance the playing experience. The findings of this study support the definition of immersion in two ways. First, the study shows how elements in the external environment, outside of the computer system, are distracting to the player's experience and ability to reach feelings of presence and flow. Second, the four emergent categories are experienced through game play and influenced by what is experienced by the capabilities of the chosen hardware, (e.g., computer and speakers). The choice to use desktop computers to experience both 2D and 3D interactions with games was relevant due to their wide use for gaming-related activities both inside and outside the classroom. Certainly, the consistency between terms was a helpful convention for this study, and made discussions about previous research between researchers and participants more useful. Because the majority of research in this area flows from the development of highly immersive types of systems, educational researchers and practitioners might be advised to enforce a more common and consistent use of language when considering the systems in educational contexts. Then, these definitions (or some other accepted convention) of immersion and presence may help enhance the ability to put into practice the results of future research.

Although it appears to be impossible to design a game that appeals to all players' personalities, game designers can become increasingly sensitive to inexperienced players' needs. For example, if educational games were designed with an option to play in first or third person, players would have the option to choose something that fits their personal preferences. Because flow is attained through personal action, game controls could be designed in a way the increases in complexity as the players' skills improve. Because presence is attained through involvement with or being influenced by the environment, game designers could design environments that involve more sensory experiences. By increasing the visual and audio appeal of a virtual environment, the immersive level of a desktop computer may increase, so the player's focus can be drawn away from the external environment that has the potential to distract from feelings of presence. So when designing educational games, designers may not easily change the perspective of the player or the mode of the delivery system (such as keyboard, mouse and 2D screen), but they can create engaging activities while increasing the video and audio appeal that do not distract the player from the educational intent of the game.

Other modifications could include increasing challenges, increasing difficulty, and giving more overall control of the game play to the player. Designers can incorporate elements into a game that allow players to more easily have an emotional connection, which can increase motivation. These modifications may allow future research to compare the differences in opinions and actions, such as those between genders, for each viewing perspective. Such findings will enhance educational game design by allowing more control of the game to fit personal preferences. Avid gamers have experience and knowledge that inexperienced gamers do not, so it may be easier for the avid gamer to become motivated and engaged in these types of activities. Giving the player more control to alter the content of the game to better fit personal preference may increase the opportunities to become engaged with the game that eventually lead to spending more time on learning activities embedded within the game. Perhaps more research should pursue the benefits of customization within educational games to inform what benefits exist when allowing students to alter game content to fit their personal preferences. An example of such research is underway by the LIFE Center, including researchers Lindgren, Fournier and Lopez (e.g.,

Lindgren et al. 2008). They have reported some camera learning effects of first-person versus third-person during instructive demonstrations. Their hypothesis suggests that increased learning results from first-person perspective due to social factors, as measured by physiological "arousal" values of heart rate and skin conductance. However, if social presence is affected by the active control of the viewing perspectives, additional work will be needed to further inform this line of inquiry. Additional research could also include a large-scale quantitative analysis of the possible influences of presence, flow, and viewing perspective on learning. The findings from a quantitative study would provide a summative analysis that could assist in triangulating the findings of this contextual research.

The question is a common one heard at educational conferences and in the mainstream media, shared by authors, parents and teachers: what can students learn from playing games? To this point, the field is concentrating its efforts in studying specific games, created and applied in specific contexts. There, we may see "pockets" of results. Instructional games when applied to a class at a curriculum level seem to have a better chance at producing results. The many challenges faced by educational game researchers are not limited to the variety of curriculum, the age and experience of the audience, and the difficulties of distinguishing meaningful learning activity from engaging non-educational components of activity. Perhaps the biggest challenge is to address how the quality and type of the game can be integrated into an effective educational lesson plan for formal and informal learning. The focus within research, then, should be on building theory that can help inform the design of what makes for an effective educational game within a larger lesson plan.

What this study shows is that learning through computer game play, and identifying the associated engaging elements tied to the game, is difficult to distinguish from the context in which it is played. In fact, it is likely not appropriate to try. If achieving a state of *flow* is a contributing factor to learning, then both in-game and external environmental variables are needed to help facilitate reaching that state. Similarly, if feelings of *presence* are important for engaging the educational material within a computer game, those feelings must be negotiated through the context of the learning activity. Game designers cannot expect to control for all of the environmental factors that make up the context, nor can they specify the way in which the game is integrated into a larger educational context with supporting materials, additional time and interaction. Yet, for a game to be considered truly successful from an instructor's point-of-view, the game play must meet the learning objectives of the lesson. For a designer, the way to implement this practice is to create games that ensure the learning goals are achieved, by embedding them into the game play itself (see Paras and Bizzocchi 2005; Shelton 2007; Shute et al. 2009). The question remains, however, whether or not a student will find this kind of activity engaging. If not, perhaps the entire enterprise of producing games for learning is wasted effort.

Acknowledgments We appreciate the efforts of the Utah State University Spring 2005 Instructional Games class (a.k.a. Luscious Sanguine Stratum) for their work in developing VOSR. We would also like to thank Tim Stowell for his work in the development of VOSR 3D. This research was partially funded by the office of the Vice President for Research Office at Utah State University.

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