Virtual Orientation Environment:
A Pilot Study of Participant Attitudes and Experiences

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Abstract
University departments compete for students from a limited pool. This paper explores the use of a virtual orientation environment to teach potential students about a department's programs, faculty and offerings. A 2-dimensional, narrative driven virtual environment was created and piloted by university students. After exploring the environment, they were surveyed regarding their experience. This paper presents findings from this pilot study including validation of the instrument and possible correlations relating to learning games, engagement, and game design.

Objectives

Students entering a university need to explore programmatic options available to them. At the same time, departments within a university need to market their programs to potential students. This serves to invite potential students to learn more about the department and helps match students with appropriate paths of study. This has traditionally been achieved with printed catalogs and more recently, web sites. With the increased interest in games and virtual environments, we chose to develop and pilot a narrative-based 2-dimentional virtual environment that would serve to orient potential students to our department.

Working with faculty, groups of doctoral students developed the virtual environment and various questions to explore as they developed the pilot study. We focused on engagement related to demographic characteristics, attitudes toward emerging technologies and design elements. How do student attitudes towards emerging technologies affect their learning experiences with virtual environments? What demographic characteristics impact student learning in virtual environments?

Theoretical Framework

This study draws heavily from the constructivist canon of Dewey, Piaget, Vygotsky and others. The work of Dewey (1987), Piagetian constructivism (1972), Vygotsky's (1978) socio-cultural theory (scaffolding), Lave & Wenger's (1991) situated learning, and Brown, Collins & Duguid, (1989) cognitive apprenticeship among others, influence current theoretical approaches towards learning within virtual environments. Dewey (1987) suggests that education is both psychological and sociological one cannot exist without the other. Change is brought about

through the interaction between the individual and his environment. Learning is based on the social nature of learning and the affordances of the environment.

Game environments are interactive, narrative environments in which participants engage in a quest to collaborate, strategize, plan, and interact with objects, resources, and other individuals (Dickey, 2006). Virtual learning environments foster the participant's intrinsic motivation by making learning fun through "engagement". They have the potential to draw the participant in, and through the power of immersion, transmit to the learner every subtle nuance of the scenario. Engagement is described as "a sense of exhilaration and deep enjoyment" or "flow"(Csikszentmihalyi, 1990, p.3). Understanding of these experiences that contribute to student "engagement" can help educators and instructional designers build better environments to support the process of learning (Jones, 2000).

Methods

Design Space: Doctoral students worked in teams developing a virtual 2-dimensional environment modeling the physical layout of department offices and meeting spaces. These images were loaded into an interactive virtual environment engine. A quest-based narrative was developed using department members as characters. The story serves to introduce participants to the people, purpose and space of this university department as well as help move them through the virtual environment. The virtual environment was placed on the Internet for access by the participants.

Survey Design: The survey instrument was assembled from a list of questions compiled from student researchers at the university. Each question was compared to original research questions then sorted into question groups according to preliminary categorization for a total of 9 question sets (Table 1.). Each question was assigned a Likert scale agreement range The survey was completed immediately after the participant completed their tour of the virtual environment. Data was collected through an online survey tool and coded for analysis using factor analysis, reliability and correlation.

Table 1: Preliminary categorization of the survey questions for the virtual environment evaluation.

Question Set	Number of Questions	Question Category
1	7	Feelings towards learning through video game environments
2	5	Importance to player of video game design elements
3	3	Feelings towards virtual learning environments
4	6	Evaluation of personal experience in virtual environment
5	5	Evaluation of narrative experience in virtual environment
6	7	Statement of personal experience with technology
7	4	Desire to see more virtual orientation/learning environments
8	10	Types of technology used by the participant
9	4	Basic demographics

Data Sources

Participants: The sample for this pilot study (n=84) was drawn from undergraduate students within the department and consisted of 19 males and 65 females from across the undergraduate spectrum: freshman n=10, sophomore n=20, junior n=30 and, senior n=22. There were three participants who did not supply information on academic standing and were not included in any analysis involving this data. Most of the students would be classified as traditional students with 77% under 26 years of age (n=64). There were 8 participants who classified themselves as over 35 and 4 of these reported being over 45 years of age. Participants were asked to provide their game experience in years of play. This produced a bimodal response with 28 participants reporting no prior experience with games and 31 reporting play experiences in excess of 7 years. The others reported play experience in between those values for an n=84.

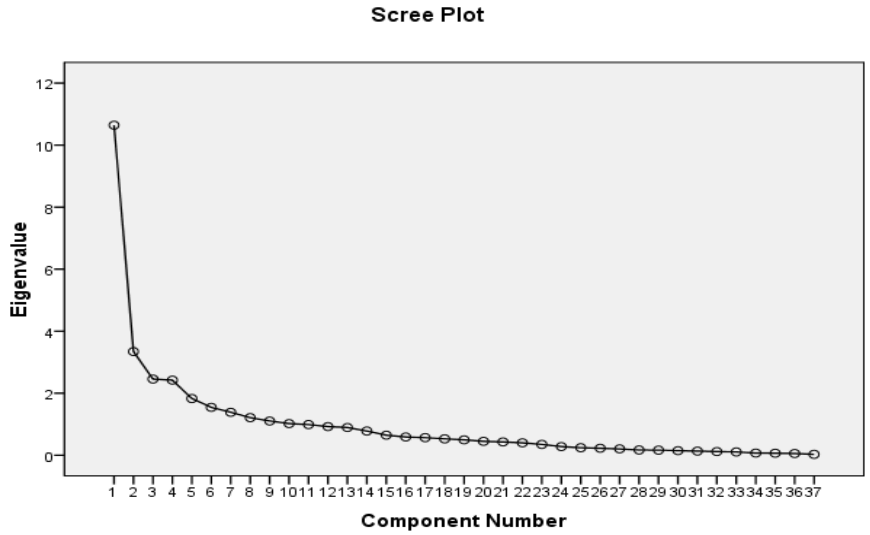
Data Collection and Analysis: Participants were supplied with a link to the virtual environment where they read and signed the approved IRB statement for the study. At the completion of their virtual tour, they were immediately directed to an online survey that explored their experience. Data collected was subjected to factor analysis and reliability testing for instrument evaluation. Correlations were run as well as a qualitative look at the survey instrument.

Results

Factor analysis was applied to the entire data set excluding the demographic data in question set 9 and the types of technology used as recorded in question set 8. The latter was subjected to its own factor analysis in an attempt to get at the characteristics of the different types of technology used by the participants. Factor analysis of question sets 1 through 7 initially resulted in 13 factors accounting for over 75% of total variance. However, many of these factors cross-loaded

and were not clearly defined. Limiting Eigenvalues to greater than 1, the scree plot (chart 1) indicated 3 to 4 factors could be extracted from the data.

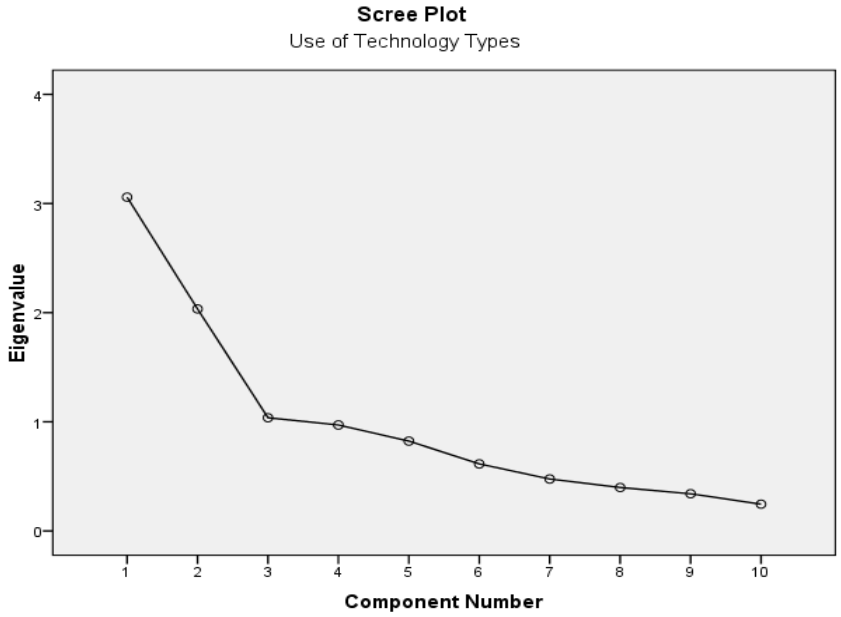
Chart 1: Scree Plot of data from pilot study indicating 3 to 4 factors emerging from the data set.



Adjusting our analysis to 4 factors, we were able to account for 50.9% of the variance. The first factor we labeled as Engagement/Enjoyment and loaded heavily with 13 items representing 22.6% of the variance producing a Cronbach's α= .94. The second factor was labeled Learning with Video Games and contained 10 items accounting for an additional 13% of the variance with a reliability of α= .81. The third and fourth factors were much weaker and were labeled Game Design and Traditional Preference respectively. Game design loaded with 5 items accounting for 8% of the variance and an α =.81 while Traditional Preference contained 8 items accounting for 6.9% of the variance and an α=.44.

Additionally, we ran a separate factor analysis on the set of questions about types of technology used by the participants. It was decided these questions would be part of the demographics defining our population and could be used to understand relationships that might exist between types of technology used by the participants and their expected experiences in the virtual environment. Running these items (n=10) produced a scree plot (Chart 2) indicating three possible factors.

Chart 2: Scree Plot of data from pilot study indicating 3 factors emerging from the data set for questions related to use of different types of technology.



We labeled these factors: Connected Technology (2-way), One-way Communication and, Personal Content Creation. The alpha in all of these factors was considerably weaker than the other factors identified. Factor 1, Connected Technology had 5 items producing a cronbach α =.61. Factor 2, One-way Communication had three items with an α=.78. However, one item loaded equally on factors 2 and 3 and when removed, the alpha for factor 2 increased to α=.82. Factor 3, Personal Content Creation loaded with 3 items and an α=.66. Removing the cross loaded item increased cronbach alpha to α=.79. Together, these three factors accounted for 61% of the variance with the variance distributed evenly: factor 1=21%, factor 2=21% and factor 3=19%.

It was clear to us that this survey needs refinement if the study is repeated. The large number of items that loaded on the first two factors likely supported the high alpha value and the low alpha for the factor of Traditional Preference was very low even with 8 items. The total percentage of variance explained by these factors was also lower than we would like to see. However, the reliability values calculated for the type of communication were quite high for the number of questions that loaded leaving room for additional questions supporting the alpha level of each. Therefore, we recommend that questions for the first two factors (Engagement and Learning with Games) be reduced and adjusted to produce greater reliability. We also recommend the addition of at least three questions each for the factors of One-way Communication and Personal Content Creation.

Correlations: Pooling the loading values for each factor, we produced a single value for each emerging factor and ran a Pearson's correlation matrix. This resulted in the following 9 correlations reaching levels of significance.

Table 2: Factor correlations from combined factors. Those items marked with an (*) have been singled out for additional focus in this paper.

Gender and Game Experience r = -.515, n = 84,p = .000	*Game design and Engagement r = .472, n = 85, p = .000
*Learning Games and Engagement r = .408, n = 85, p = .002	Connected and One-way Communication r = .274, n = 85, p = .011
*Learning Games and Game Design r = .341, n = 85, p = .000	Connected and Age r = -.269, n = 83, p = .014
Learning Games and Connected r = .308, n = 85, p = .004	One-way Communication and Content Creation r = .319, n = 84, p = .003
Learning Games and Game Experience r = .332, n = 84, p = .002	

The strongest correlation appears to be between Gender and Game Experience (r = -.515, n = 84,p = .000). This was a negative correlation indicating that females reported lower levels of prior experience playing games. However, we feel this may need further testing as the number of females participating (n = 65) in the study were much higher than the number of males (n = 19).

While the remaining correlations in this data set are not particularly strong, we chose to focus on the factors of Game Design, Engagement and, Learning Games. Each of these resulted in moderate levels of correlation and might warrant further investigation. In all three of these factors, positive correlations were reported. Learning Games suggested higher levels of engagement while Game Design elements possibly informed participant Engagement. Game Design elements also seemed to indicate the possible importance of design in the development of actual Learning Games.

Loading the survey instrument into Atlas.ti for qualitative analysis helped reveal additional characteristics of the survey instrument. Game Design was moderately correlated with the factor Engagement in our initial analysis. The implication is that game design matters as related to

satisfaction with the game or what might be considered engagement. This is not a surprise, as quality of game design would indicate the quality of the game. Exploring the survey questions related to these factors, we find four of the six questions related to Game Design addressed graphics. Two of these asked about color while the other two dealt with realism and visualizing game space. Looking at Engagement/Enjoyment, the questions focused on enjoyment and engagement related to the virtual environment experience rather than their enjoyment of games in general. Engagement was also attached to narrative and to learning through virtual environments. Looking at the characteristics of questions relating to Learning Games we find a mix of questions looking at participants ideas surrounding the concept of learning through games as well as overlapping content with both Game Design and Engagement (color, enjoyment, engagement). We also find a few questions dealing with the participants over-all comfort with different types of technology.

Significance, Limitations and Future

We believe the pilot study supplied enough evidence to warrant further study related to using virtual environments as orientation tools for potential students in university programs. The reported correlation between learning games and engagement seems to indicate enjoyment as supported by Csikszentmihalyi's (1990) discussion relating engagement to enjoyment. The importance of game design was also linked to engagement indicating the importance in considering the level to which a virtual environment for orientation purposes might need to be developed to reach satisfactory levels of engagement.

Limitations in this study were inherent in the composition of the study population as well as the structure of the survey. To better understand these factors in the future, the survey should be adjusted to limit overlaps resulting in cross-loading. Additionally, we might consider creating a two part survey with the revised Likert style survey being administered after the participants complete an open-ended survey. This would help capture participant's language and perspective related to their experience and help to inform further interpretations of the data collected in the new survey. While we were not able to use the data from this study to directly address our research questions, we were able to find possible links between engagement/enjoyment, game design and learning through games. This is promising and is supported by the literature. The virtual orientation environment does seem to address these elements and in the end, it seems that this virtual environment has merit for further study.

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