Motivational Factors in Game Play in Two User Groups

Melanie Kellar & Carolyn Watters
Faculty of Computer Science
Dalhousie University
Halifax, NS
{melanie,watters}@cs.dal.ca

Jack Duffy
School of Business Administration
Dalhousie University
Halifax, NS
j.duffy@dal.ca

ABSTRACT
Motivation is one of the driving forces behind the recent interest in games with educational goals. People willingly play complex games and we would like to channel that willingness to participate in complex challenges into the educational context. In this paper, we report on a survey administered to computer science and business students, two distinct groups of game players, in order to examine the role of motivation in electronic games. The results of the survey are presented, including a gaming profile of each group, as well as a series of design suggestions for educational games and activities that are based on these results.

Keywords
Motivation, education, gaming, user profiles, design, survey, questionnaire.

INTRODUCTION
The underlying premise of this research is that the motivation students exhibit in playing games can be capitalized on to develop educational activities, drawing students in similar manners such as enthusiasm for learning complex skills and persistence in the activity. In this paper, we report on the results of a survey examining the role of motivational factors in two game playing populations: computer science students and business students. The survey is intended to address two questions. First, are motivational factors relevant to the choice of games and the playing of games in these populations? Second, are motivational factors specific to the populations or shared across the populations? The answers to these questions will be useful in two ways. Firstly, we can examine the similarities and differences in responses to motivational factors to evaluate the premise that games are generally motivating and that presenting educational material as a game may increase the motivation of students to participate. Secondly, those motivational factors that appear strongly among both groups may be useful in the design of educational applications that require persistence and self-directed learning without necessarily creating it as a game.

Proceedings of DiGRA 2005 Conference: Changing Views – Worlds in Play.

MOTIVATIONAL FACTORS

Motivation is the driving force behind the recent interest in games with educational goals. That is, if people willingly play complex games, we would like to channel that willingness to participate in complex challenges into the educational context. Increased motivation has been correlated with enhanced task performance, persistence and enjoyment [9] as well as overall user satisfaction [3]. Furthermore, task characteristics that have an impact on motivation (e.g., duration, type of goal and presence of rewards) may influence user evaluations more than interface factors, such as layout and design, use of graphics and even perceived currency of information [8].

A metalevel analysis of psychological literature on motivation [12] provides a theoretical foundation for discussion of interface design decisions that may consciously or unconsciously affect the motivation of the user and ultimately the success of the system.
This metalevel analysis included empirically supported research in three main areas; intrinsic motivation, expectation of success and incentives. Intrinsic motivation theories, such as Self-Determination [6], Flow [5] and Goal theories, focus on the reasons for participation. Intrinsically motivated tasks are those where the individual is completing some task for which the main reason is personal enjoyment in doing the task. Self-efficacy [1, 2] and Control theories [4] are based on expectations of success and consider the effect on motivation of self-beliefs of competence and feelings of control over outcomes, have been shown to be relevant to the motivation of children in school achievement [11]. Attribution [13] and Expectancy-value [7] theories integrate competence beliefs and expectancies of success with incentives to engage in achievement tasks.

From this metalevel analysis, a framework of positive and negative motivational factors for the educational context was proposed: control, context, competency and engagement. Control factors support self-regulation or autonomy, such as interaction, encouragement of innovation, providing rationales, providing relevant goals, choice and managed guidance. Context includes rationales, feedback and storyline. Competency factors include scaffolding of tasks, appropriate feedback, attainable challenges and models of successful strategies. Engagement factors include personalization, rewards, role playing, challenge, personal notes, collaboration and communication. These factors of motivation are not necessarily discrete sets and aspects may be associated with multiple factors.

Using this framework of motivational factors we surveyed two university populations, one of ardent game players and one of less frequent game players, to understand of the role of these factors in game play in these two populations. That is, what impact do the reported motivational factors have in the context of game playing as reported by these students?

METHODOLOGY

We surveyed two user populations because we were interested in the similarities and differences in their game playing habits. The two populations consisted of Business students (Group I) and Computer Science (Group II) students.

Group I consisted of 111 Masters of Business Administration (MBA) students (43% female) recruited from the Faculty of Business at Dalhousie University from the core course “BUSI 5305 - Managing People.” These students were allowed to complete the questionnaire for course credit. The questionnaire was completed electronically using a Microsoft Word forms document.

Each student signed a paper consent form prior to beginning the study. The students were given a two week period to complete the study. The Word document containing the questionnaire was downloaded from the study website. The participants completed the questionnaire electronically on their own time and emailed the document to the researchers involved in the study. The median age of the Group I participants was 26.

Group II consisted of 59 Computer Science (CS) students (17% female) recruited from the Faculty of Computer Science at Dalhousie University. Although the female to male ratio is much smaller within this group it does reflect the female to male enrollment ratio in this program. Participants were recruited through a mass email sent to all computer science students and did not receive any remuneration for completing the survey. The questionnaire was completed online from the study website during a two week period. An online information letter was provided to participants before beginning the questionnaire. The submission of the questionnaire implied consent as participants had to click a link at the bottom of the letter that stated they wished to take part in the study. The median age of the Group II participants was 22.

The questionnaire was composed of 55 questions and took approximately 20 to 30 minutes to complete. The format of the questions consisted of free text, multiple choice, ranking and Likert-scale type questions. Questions were designed to probe participants' game playing habits related to factors of motivation: control, context, competency and engagement. The questionnaire was divided into two sections. The first section of the questionnaire was related to preferred game types (single versus multiplayer games) and factors that influence which games participants seek out, keep playing and stop playing. The second section of the questionnaire required participants to choose a favorite electronic game and answer the questions in that section using their favorite game as a reference point. This section included some similar questions to those in section one and also had questions relating to choices in games, personalization, feedback and collaboration.

Although the methodology and sample sizes for each group differed, it is important to point out that both groups did complete their forms electronically and completed the same questions in the same order. Given the large number of participants completing the questionnaire from each group we do not anticipate that these small methodological differences will have an effect on the overall results.

RESULTS

User Profiles

General user profiles were constructed for both groups using the results of the questionnaire. The MBA students represent a segment of the population that is well educated and does not see gaming as a prime entertainment source. In our survey, this population ranked playing electronic games as their sixth most favorite activity (out of seven). These students played on average only two different games and played relatively infrequently, typically once a week for fun when they were bored or needed a break. When these students played multiplayer games they preferred to play with others they knew in the same room and relatively infrequently played online games. They preferred chat and instant messaging over email for communication. The most popular favorite games for this group were Board/Card games.

The CS students represent a somewhat younger segment of the population that is well educated and technically oriented and that sees gaming as an important source of entertainment. This

population ranked playing electronic games as their second most favorite activity (out of seven). These students played on average six different games and played more than once a week, often daily, for fun when they needed a break or to improve their skills. These students regularly participated in online games and multiplayer games, often with people they did not know. They also preferred chat and instant messaging over email for communications. The most popular favorite games for this group were quest and role playing games.

Motivational Factors

Control factors support self-regulation or autonomy, such as interaction, encouragement of innovation, providing rationales, providing relevant goals, choice and managed guidance. Overall, we discovered that the two groups shared similar preferences for factors of control. Both groups reported playing games that allowed them to make choices and made use of the ability during the game. The most common types of choices exercised include speed levels, camera angles/views, time limits, difficulty and music. Students also reported they made use of options that allowed them to replay previously played levels and almost always finished each level before moving on to the next. One main difference that was reported by the two groups was the use of side games and extra features, which were more popular among the computer science students.

Context factors include rationales, feedback and storyline. There were very few significant differences between the groups. Our results surrounding the importance of storyline and characters in game play were somewhat unclear, however the indications from this survey were that they are not as important as we expected. This was more pronounced among the business students. As evidence, the most popular genres of games played by this group were puzzle and card games, such Tetris, Snood and Solitaire. Most games belonging to these genres contain little or no storyline and very shallow characters, if any. We found that animation and graphics were the most highly ranked sources of feedback for both groups and that both groups personalized several aspects of their games.

Competency factors include scaffolding of tasks, appropriate feedback, attainable challenges and models of successful strategies. Challenge and feelings of competency were important factors for both groups of students, however, in many instances this was more evident among the computer science group. An appropriate level of challenge was important to both groups and they reported they played games that were difficult to master. When learning how to play new games, the most popular responses by both groups were that they learned by themselves, with the help of friends and through game instructions. Difficult levels, when encountered, were conquered through persistence and help from friends. The computer science students also reported often using online answers to pass difficult levels, much more so than the business students.

Engagement factors include personalization, rewards, role playing, challenge, personal notes, collaboration and communication. Games are engaging and participants play them for fun and for extended periods of time. The two groups of students differed most in terms of factors of engagement. Many of these differences may be attributed to their exposure to technology. Both groups reported they preferred multiplayer games, however the business students reported playing with other players they knew in real life and typically were located in the same room. The computer science students reported they often played online and were much less likely to know their opponents in real life. The computer science students also participated in online gaming communities. Surprisingly, the average length of play for both groups was not

significantly different; computer science students played on average for 96 minutes and business students played on average for 87 minutes, indicating that both groups were engaged in their game play.

DISCUSSION

In order to encourage motivation among students engaging in educational activities and games, we make the following design suggestions for each of the four factors of motivation: control, context, competency and engagement.

In order to encourage *control*, students should be allowed to make choices throughout the activity. For instance, adjust the level of difficulty or change the current view. Coping mechanism, such as the ability to backtrack and finishing each level before trying the next, can be used to help students through difficulties.

Our examination of the *context* factor found that it may be important to provide means for synchronous communication between students, such as chat and instant messaging. Feedback in the form of animation and voice were the most popular among our participants. Another important aspect of context is personalization. Students should have the ability to personalize the behavior and appearance of the characters. Surprisingly, the importance of storyline was not clear.

When examining *competency*, we found that challenge is an important aspect of game playing and therefore activities should have a fairly high level of challenge. Students can be given the ability to learn by themselves or with friends, in addition to a structured teaching situation. For the more technologically advanced students, online communities may be an excellent forum for them to learn from each other.

Multiplayer activities can play an important role in the *engagement* of students. These activities can be online, in the same room or both. Multiplayer activities with humans encourage social interactions, especially if synchronous forms of communication are available or if the students are situated in the same room. Since game players often interact with other players (who are usually their friends), it is important to encourage this social interaction when playing educational games.

Many of the differences observed between the two groups may be attributed to the participant's exposure to technology. Group II participants can be viewed as early adaptors of technology whereas Group I participants can be viewed as late adaptors. We conducted a validation of the survey with seventeen high school students. As most of the students grew up with technology, they are also viewed as early adaptors. As expected, their responses were more similar to the Group II participants than Group I.

FUTURE WORK & CONCLUSIONS

As a result of the unclear results we received with respect to the importance of characters and storyline in games, we feel that further exploration is necessary to determine their importance in games. It is, however, interesting that many of our participants' favorite games were puzzle and card games, such Tetris, Snood and Solitaire. Most games belonging to these genres contain little or no storyline and very shallow characters, if any.

Future work will necessitate the incorporation of these design suggestions into educational games and activities to evaluate their effect on students' motivation. We surmise that these design considerations will help increase motivation by increasing enthusiasm for learning new skills and persistence in the activity.

One of the most interesting results was the similarity between the two groups in terms of the average time of a game session. This was surprising as we had expected Group II to report much longer sessions of game play. Our goal would be to develop educational activities that motivate students to participant eagerly for ninety minute sessions. Studying these two distinct groups has allowed us to capitalize on the similarities that exist between them. Based on these similarities we have presented design suggestions for educational games and activities that may appeal to a wide variety of students.

ACKNOWLEDGEMENTS

This research was funded by the Canadian Natural Science and Engineering Research Council and the Social Science and Humanities Research Council.

REFERENCES

1. Bandura, A. (1977). Self-Efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review, 84*: 191-215.
2. Bandura, A. (1986). *Social Foundations of Thought and Action: A Social-Cognitive Theory*. Upper Saddle River, NJ: Prentice-Hall.
3. Bumpus, M. and Olbeter, S. (1998). Influences of Situational Characteristics on Intrinsic Motivation. *Journal of Psychology Interdisciplinary & Applied, 4*(132): 451-461.
4. Crandall, V. C., Crandall, V. J., and Katkovsky, W. (1965). A Children's Social Desirability Questionnaire. *Journal of Consulting Psychology, 29*(1): 27-36.
5. Csikszentmihya, M. (1990). *Flow = The Psychology of Optimal Experience.* New York, NY: Harper and Row.
6. Deci, E., Schwartz, A. J., Sheinman, L., and Ryan, R. M. (1981). An Instrument to Assess Adults' Orientations toward Control versus Autonomy with Children: Reflections on Intrinsic Motivation and Perceived Competence. *Journal of Educational Psychology, 73*: 642-650.
7. Eccles, J. and Wigfield, A. (2002). Motivational Beliefs, Values, and Goals. *Annual Review of Psychology, 53*: 109-132.
8. Lucas, H. C. and Spitler, V. K. (1999). Technology Use and Performance: A Field Study of Broker0020Workstations. *Decision Sciences, 30*(2): 291-312.
9. Pinder, C. C. (1998). *Work Motivation in Organizational Behaviour*. Upper Saddle River, NJ: Prentice-Hall.
10. Skinner, E. A. (1998). Strategies for Studying Social Influences on Motivation. In J. Heckhausen and C. Dwek (Ed.), *Motivation and Self-Regulation Across the Life Span* (pp. 216-234). Cambridge, UK: Cambridge University Press.
11. Watters, C. and Duffy, J. (2004). Metalevel Analysis of Motivational Factors for Interface Design. In K. Fisher, Erdelez, S. and McKechnie, E.F. (Ed.), *Theories of Information Behavior: A Researcher's Guide*. Medford, NJ: ASIST (Information Today, Inc.) (In Press).
12. Weiner, B. (1985). An Attributional Theory of Achievement Motivation and Emotion. *Psychological Review, 92*: 548-573.