

COMMUNICATION AND COLLABORATION IN EDUCATIONAL MULTIPLAYER MOBILE GAMES

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ABSTRACT

Mobile games present unique possibilities for education. Games in education allow the flexibility to adapt easily to different circumstances, context, and varying number of players. Central to collaboration in multiplayer mobile games is the ability of players to communicate with one another. An understanding of the problems and possibilities underlying this fundamental attribute would enable designers and practitioners to identify high-risk technologies. It will also assist them to predict the stability and reliability of their communication medium. This paper provides an overview of the mobile gaming literature and draws conclusions related to the communication and collaboration features in existing educational mobile games.

KEYWORDS

educational mobile games, collaboration, communication, medium, mobile gaming

1. INTRODUCTION

Mobile phones have infiltrated our society and are shaping many of our actions and interactions in formal as well as informal situations. The ease with which the technology can be navigated and applied in a variety of circumstances has caused a widespread adoption of mobile communication. Mobile gaming thus potentially has a wide base of users that are already proficient in the use of the technology. This makes it a very attractive medium for education, allowing for innovative approaches and new design principles.

Schwabe and Göth (2005) indicate that mobile games offer unique opportunities to embed learning in the environment. This perspective offers a prospect to incorporate the environment as a participant in educational gaming. A challenge of this type of multiplayer mobile gaming would be to enable collaboration through effective communication utilizing the available technology (Thomas et al., 2003, Vasudevan, 2006).

The literature that reports on this aspect of educational gaming is relatively sparse and often indirectly mentions communication problems. A limited few articles report on the extent to which this breakdown in communication influences the collaboration of participants. An understanding of the reliability and affordances of different communication media would enable researchers and developers to utilise resources more effectively. They would be able to use existing solutions to support the communication and collaboration features in multiplayer mobile gaming. This paper reports on our attempt to identify communication mediums and to draw comparisons about the reported reliability and effectiveness of the different mediums.

2. LITERATURE OVERVIEW

The majority of the articles that report on mobile games are entertainment and fun oriented. It appears that authors often report from a technology perspective and disregards or does not include any validation of claims and results.

As the ability of players to effectively collaborate is dependent on, and enabled by communication, the capacity of technology to support this is fundamental to the success of a game. This dependence on the technology becomes more evident when communication forms an integral part of the game play and the game in itself hinges on the ability to cooperate through technology enabled communication (Benford, et al., 2005, Nova, et al., 2006, Sánchez, et al., 2006).

The literature reveals two main categories in reporting multiplayer mobile games for educational purposes. The first category could be classified as reflections on practice. This includes reports on empirical research, initial evaluations and feedback on various game prototypes. This can further be subdivided into pervasive games (Islas-Sedano, et al., 2007) and location base games (Flintham, et al., 2003). Of these, games that are location-based are most often used for facilitating communication and collaboration. Articles that are of a more theoretical nature (Antonellis, et al., 2005, Koivisto, E., 2007, Thomas, et al., 2003, Vasudevan, 2006) include literature reviews, reviews of existing games, new game concepts and recommendations for the future developments. Both of these perspectives however explicitly or implicitly link communication and collaboration.

Communication is reportedly facilitated by the use of digital images for example (1) photos and (2) videos, (3) text, (4) voice, and (5) through various different peripheral technologies. The latter can be described as technology that provides information relevant to players from a game server. The information concerned is, for example, the position or additional data about other players and information embedded or relevant to the environment as relayed with sensors, GPS or other tracking and location aware technologies. (Ballagas, et al., 2006, Barkhuus, et al., 2005, Bell, et al, 2006, Benford, et al., 2005, Bjrk, et al., 2001, Casey, et al., 2007, Cheok, et al., 2004, Islas-Sedano, et al., 2007, Flintham, et al., 2003, Koivisto, et al., 2006, Mansley, et al., 2004, Mottola, et al., 2006, Nova, et al., 2006, Sánchez et al., 2006, Schwabe and Göth, 2005).

Digital images and music are seldom used in educational mobile games but all the reviewed games incorporated the environment through the use of diverse peripheral technologies. A combination of GPS technology and wireless networks are frequently reported on and often used to support collaboration and communication in multiplayer mobile games (Barkhuus, L. et al., 2005, Benford, S. et al., Cheok, A. D. et al., 2004, 2005, Flintham, M. et al., 2003). Figure 1 below represents the communication types that are prevalent in educational gaming.

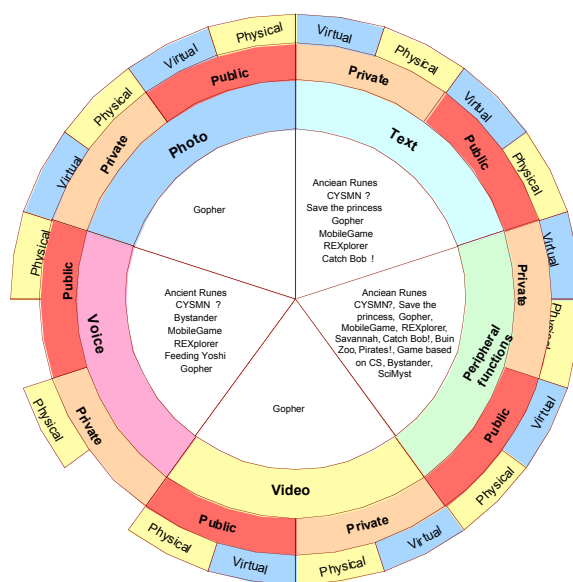


Figure 1. Communication types in existing games

The communication modes can be further sub classified as either private, which is between players or a team of players, or public and viewable by all (Antonellis, I. et al., 2005). There is distinction between communications that is enabled in the physical world (e.g. game *Savannah*, Benford, et al., 2005), the virtual

(e.g. game *CatchBob!*, Nova et al., 2006) and those that are support in a blended environment (e.g. game *Save the princess*, Mottola, L. et al., 2006). This holds for all the different modes of communication except direct speech, which, at the time of this research, has only been incorporated in the physical world (Flintham 2003).

3. ANALYSIS

The figure above provides a visual representation for the implementation of different communication modes that enables collaboration. Using this model it is now possible to map the main obstacles encountered by practitioners to the modes of communication enabled by the technology. These obstacles are reported to be problems associated with the design of the game play (e.g. coordination), personal understanding, hardware problems, and software implementation. Table 1 provides a description of the reported challenges. These elements of games only become a challenge to the player if it does not support the necessary mode of communication, resulting in the inability to collaborate. Each identified element has been subdivided into technology affordances that would directly, and those that would indirectly cause a breakdown in the communication that of a multiplayer mobile game.

Table 1. Collaboration challenges

| | | |
|----------------------------------|-----------------|---|
| Game Play | Direct | Voice and text. For games based on voice communication the frequent problem is with understanding. This brings later lacks in strategy and player's confidence. |
| | Indirect | Synchronization. The synchronization that should take place between partners or a team, but also outside them. Time. To achieve stable players' cooperation and collaboration, the players have to spend some time in playing together, but normally mobile games do not offer enough time for it. Rules. For some games the cooperation is not required, and you can reach the game goal by playing alone. In other occasions game rules can be not clear or too difficult. |
| Personal Understanding | Direct | Peripheral technologies. The technological misunderstanding for the players. Some games required special equipment and for some participants it can be problematic to use new devices. |
| | Indirect | Social characteristics. The difference in education level, age, social background, or incorrect analysis of target groups brings challenges for the understanding of the game or devices. It also can be present ethical controversies. |
| Hardware related Problems | Direct | Text, voice, video, peripheral technologies. The system latency is one of the most limiting factors for communication problems. E.g. mobile providers do not support mostly video streams, or the implementation of voice conferences on mobile devices can be also complex. These can affect the players' communication and learning level. |
| | Indirect | Device limitations. The slow CPU speed, limited storage space, low precision on screen and requirement of large battery capacity. |
| Software Implementation | Direct | Peripheral technologies. Some games have implementation problems as they do not sufficiently enable hardware features within software, or tools for collaboration support. |
| | Indirect | User interface. Some games present insufficient or incorrect icons, color, characters between other interface features. In some cases it is not clear how to use game functions or navigate through the phones. Visualization. In location-based games player does not always see new position on a screen. Other type of games, do not visualize what the player is typing or for some player written communication is difficult even in PDA. |

The individual players do not always utilize the collaborative functionality as reported in the *SciMyst* (Islas-Sedano, C. et al., 2007) and *Gopher* (Casey, S. et al., 2007) games.

4. CONCLUSION

There are no problem free educational multiplayer mobile games. All of games reviewed presented a number of problems directly or indirectly influencing communication. In spite of these apparent challenges, most practitioners reflect favorably on the concept of communication and collaboration between the players. The combination of text, speech and peripheral technologies are most effectively used to support communication and collaboration in reviewed mobile games.

The main challenge we found was that most multiplayer mobile games were not concerned with educational aspects and insufficient attention has been given to collaboration these multiplayer mobile games. There are still many unanswered questions regarding collaboration in educational multiplayer mobile games. This review has been an attempt toward analyzing the current situation, and can be useful to future researchers.

REFERENCES

- Antonellis, I. et al., 2005. Game Based Learning for Mobile Users. 6th International Conference on Computer Games: *AI and Mobile Systems (CGAIMS 2005)*, Louisville, Kentucky, USA.
- Ballagas, R. et al., 2006. REXplorer: A Pervasive Spell-Casting Game for Tourists as Social Software. In *CHI 2006 Workshop on Mobile Social Software (MoSoSo)*
- Barkhuus, L. et al., 2005. Picking Pockets on the Lawn: The Development of Tactics and Strategies in a Mobile Game. *Proceedings of the 7th International Conference on Ubiquitous Computing*. Tokyo: Springer, pp. 358-374.
- Bell, M. et al., 2006. Interweaving Mobile Games with Everyday Life. *Proceeding of ACM Conf. Human Factors in Computing Systems CHI 2006* (Montreal, CA). New York: ACM.
- Benford, S. et al., 2005. Life on the edge: supporting collaboration in location-based experiences. *Proceedings of the 2005 CHI Conference on Human Factors in Computing Systems*, Portland, Oregon: ACM Press, pp. 721-730.
- Bjrk S. et al., 2001. Pirates! - using the physical world as a game board. *Interact IFIP TC.13 Conference on Human-Computer Interaction*.
- Casey, S. et al., 2007. The Gopher Game: A Social, Mobile, Locative Game with User Generated Content and Peer Review. *Proceedings of the international conference on Advances in computer entertainment technology*, Salzburg, Austria: ACM Press, pp. 9 – 16.
- Cheok, A. D. et al., 2004. Human Pacman: a mobile wide-area entertainment system based on physical, social, and ubiquitous computing. *Advances in Computer Entertainment Technology 2004*: 360-361.
- Flintham, M. et al., 2003. Where on-line meets on-the-streets: experiences with mobile mixed reality games. *Proceedings of the CHI 2003 Conference on Human Factors in Computing Systems*, ACM Press, New York
- Islas-Sedano, C. et al., 2007. Where is the answer? – The importance of curiosity pervasive mobile games. Forthcoming Future play conference, November 14-18, 2007. Toronto, Canada
- Koivisto, E. et al., 2006. Ancient Runes - Using Text Input for Interaction in Mobile Games. *Proceedings of ACM SIGGRAPH Video Game Symposium*. Boston, USA.
- Koivisto, E., 2007. Mobile Games 2010, URL: <http://research.nokia.com/tr/NRC-TR-2007-011.pdf>. Accessed July 15,2007.
- Mansley K. et al., 2004. Feedback, Latency, Accuracy: Exploring Tradeoffs in Location-Aware Gaming. *Proceedings of ACM SIGCOMM 2004 Workshops on Netgames '04, Network and System Support for Games*. Pages 93–97.
- Mottola, L. et al., 2006. Pervasive games in a mote-enabled virtual world using tuple space middleware. *NETGAMES 2006*: 29.
- Nova N. et al., 2006. A Mobile Game to Explore the Use of Location Awareness on Collaboration. In *Poster for HCI International 2005, Las Vegas, USA*.
- Sánchez J. et al., 2006. Mobile Game-Based Science Learning. *Proceedings of the Distance Learning and Internet Conference, APRONet 2006*, Tokyo, pp. 18-30.
- Schwabe, G. and Göth C., 2005. Mobile Learning with a Mobile Game: Design and Motivational Effects. *Journal of Computer Assisted Learning*, vol. 21, no. 3, pp. 204.
- Thomas, S. et al., 2003. Designing for Learning or Designing for Fun? Setting Usability Guidelines for Mobile Educational Games. *Proceedings of MLEARN 2003: Learning with Mobile Devices*, London.
- Vasudevan, V., 2006. Collaborative Mobile Gaming Enabling socially interactive, participatory, media-rich gaming experiences. Position Paper, Motorola Inc, Illinois USA.