Tan, S. C. et al. (Eds.) (2013). Workshop Proceedings of the 21st International Conference on Computers in Education. Indonesia: Asia-Pacific Society for Computers in Education

A Courseware Developed with Toy-like Interactive Interfaces

Ping-Lin FAN [a*], Hsueh-Wu WANG [a], Su-Ju LU [a], Chi-Shan YU [a] & Wei-Hsien WU [b]
[a] *Department of Digital Technology Design, National Taipei University of Education, R.O.C.*
[b] *Department of Computer Science, National Taipei University of Education, R.O.C.*
* plfan@tea.ntue.edu.tw

Abstract: The current study proposes a courseware built on game design and operated with toy-like interactive interfaces, which aims to increase students' enjoyment, and motivation. The authors developed small scale educational games with sensor-based interfaces and observed children's learning experiences when using presented novel input interfaces. The participants are 192 fourth- and sixth-grade students in Taiwan. Through the preliminary observations, this study found that toy-like interactive interfaces not only attracts the interest and gain enjoyments of children, but also stimulates their learning motivation. The findings have highlighted the value of the courseware with toy-like interfaces and indicated that the introduction of novel interfaces can be a useful tool for enhancing classroom learning activities.

Keywords: sensor-based interactive device, human-computer interface, game-based learning

1. Introduction

The rapid emergence of information technology applications has facilitated numerous attempts to provide alternatives to traditional classroom teaching by creating course materials that incorporate new information technologies, which engage learners in a more pleasant learning process (Lankshear & Knobel, 2006). Classroom teachers and researchers have explored the integration of game features into the curriculum to enhance students' interest in learning using the video and audio characteristics of digital games (Prensky, 2003). Game-based learning can effectively enhance students' learning motivation and effectiveness and the potential of using computer games as an educational tool in the classroom is promising (Oblinger, 2004；Paraskeva, Mysirlaki, & Papagianni, 2010).

Aunola, Leskinen and Nurmi (2006) contended that learning motivation is an important factor for learning effectiveness. Thus, teachers who try to achieve educational objectives could introduce games in curricular contents to create a courseware that would promote students' learning interest. Students could also immerse themselves in the learning situation and improve their motivation (Burguillo, 2010; Kebritchi, Hirumi, & Bai, 2010).

Recently, due to the remarkable progress in hardware/software for information technology, a significant research growth in human-computer interaction (HCI) field has been made. Instead of traditional input devices (mouse/keyboard), many novel input and output devices, such as visual-based, audio-based and sensor-based interactive devices that can realize ubiquitous computing and the multimodal human-computer interaction (MMHCI) era is coming (Jaimes & Sebe, 2007). By using sensor-based interactive technology, the current study presents a novel alternative to interact with computers and to experience learning activity with courseware designed with game contents for children.

2. Methodology

Phidgets Inc. provides a set of sensor-based devices for universal serial bus (USB) sensing and controlling to/from computers. Various supported programming languages along with an in-depth application programming interface (API) are also provided (Phidget Inc., 2013). The courseware developed in project consists of seven course units, which are designed to be interactive, that is, they

allow the users manipulate novel sensor-based devices to process each course unit of the proposed system (Figure 1).

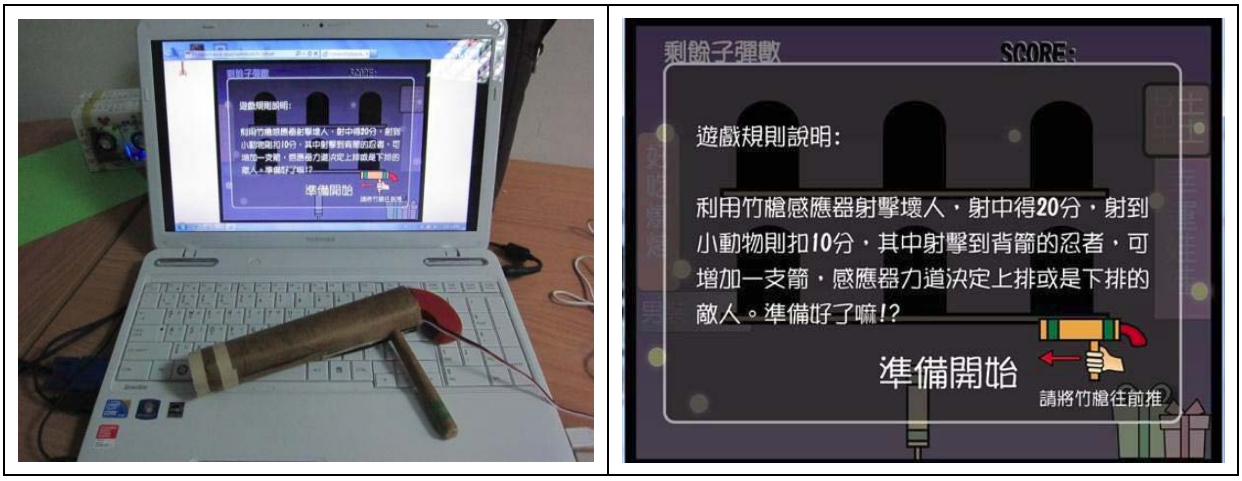

Figure 1. A representative screenshot of the toy-like interactive devices(Bamboo pistol)developed in this study.

192 children aged 11 to 12 years from primary schools in Taiwan participated in the present study. The authors used existing questionnaires (original and modified) to create an instrument aimed at collecting data on entertainment, and immersion of the courseware operated with the toy-like interactive system. Participants were asked to answer the questionnaires upon completion of all toy-like interactive devices.

3. Conclusions

This study has observed how children interact with a toy-like interactive courseware. The results indicate that children have higher immersion and greater attention when using the toy-like interactive system. Even without special skills or any assistance, children can easily operate the proposed toy-like interactive system. The toy-like interactive system is suitable for classroom assistant teaching for elementary school students.

From the learning perspective, the authors are not only interested in human-computer interaction to interpret user actions toward a desired system's events, but also in the potential of game-based learning. In this sense, a novel interactive interface to manipulate a computer educational game has been developed in the current study. Compared to the traditional keyboard/mouse input, the proposed system fosters better learning processes from an engagement viewpoint. However, usability of the proposed system is more emphasized than learning efficiency in this study. Future research will explore more instruction design issues affecting learning performance of students with the courseware. Learning performance related topics are worth further investigation in the near future.

Acknowledgements

This research was sponsored by National Science Council of Taiwan, project numbers NSC 102-2511-S-152-018 and NSC 100-2511-S-152-011-MY2.

References

Aunola, K., Leskinen, E., & Nurmi, J. E. (2006). Developmental dynamics between mathematical performance, task-motivation, and teachers' goals during the transition to primary school. British Journal of Educational Psychology, 76, 21-40.

Burguillo, J. C. (2010). Using game theory and competition-based learning to stimulate student motivation and performance. Computers & Education, 55(2), 566–575.

Cordes, C. & Miller, E. (2002). Fool's gold: A critical look at computers in childhood. College Park, Alliance for Childhood. Retrieved from http://www.allianceforchildhood.net/projects/computers/computers_reports_fools_gold _contents.htm

Jaimes, A. & Sebe, N.(2007), Multimodal human-computer interaction: A survey. Computer Vision and Image Understanding, 108(1-2), 116-134.

Kebritchi, M., Hirumi, A., & Bai, H. Y. (2010). The effects of modern mathematics computer games on mathematics achievement and class motivation. Computers & Education, 55(2), 427–443

Lankshear, C., & Knobel, M. (2006). New literacies: Everyday practices and classroom learning. Maidenhead, Berkshire: McGraw Hill/Open University Press.

Oblinger, D. (2004). The next generation of educational engagement. Journal of Interactive Media in Education, 1-18.

Paraskeva, F., Mysirlaki, S., & Papagianni, A. (2010). Multiplayer online games as educational tools: Facing new challenges in learning. Computers & Education, 54(2), 498–505.

Phidgets Inc. (2013). Products for USB Sensing and Control. Retrieved from http://serc.carleton.edu/introgeo/games/index.html

Prensky, M. (2003). Digital game-based learning. ACM Computers in Entertainment, 1(1), 1-4.

Subrahmanyam, K., Kraut, R. E., Greenfield, P. M. & Gross, E. F.(2000), The impact of home computer use on children activities and development. Children and computer technology, 10 (2), 123-144.