A Movement-based Game Designed according to Input-Process-Outcome Model in a Cooperative Learning Environment in Hygiene Education

Yu-ching Chen, Chinese Culture University, Taiwan
Yih-jiun Lee, Chinese Culture University, Taiwan
Tsuei-ju Hsieh, Chinese Culture University, Taiwan

The Asian Conference On Education 2015
Official Conference Proceedings

Abstract

Research showed that first graders have difficulty developing their daily hygiene habits when they bridge their lives in kindergartens and primary schools. Hygiene education is usually in a regular classroom with traditional learning materials that can hardly attract students' attention and make individual practice possible. Although there are computer-aided learning materials available on the web, the materials lack a sense of reality because they are controlled by mouse only. Movement-based games enable intuitive manipulation that control games by body movements instead of keyboards and mouse. Movement-based games have been used in learning. However, game-based learning does not guarantee better learning effects than traditional teaching. The balance of entertainment and education by adopting appropriate pedagogy is essential. The Input-Process-Outcome learning model emphasizes the importance of taking entertainment and education into consideration. This study developed a movement-based game designed according to Input-Process-Outcome in a cooperative learning environment (IPO-MGBCL) to enhance the performance of elementary students' hygiene knowledge developing. The results showed that the IPO-MGBCL group had better learning outcome.

Keywords: Movement-based Game, Input-Process-Outcome Learning Model, Cooperative Learning

Introduction

The learning and life adoption in the first grade has become the foundation of students' character development, learning style, and school life. The primary school students are believed to have high potential of learning. Acquiring accurate health knowledge, attitude and developing healthy habits and behaviors are beneficial to their lives (Chen, Lin, Ho, & Huang, 2012). Research showed that first graders may have difficulty developing their daily hygiene habits when they bridge their lives in kindergartens and primary schools. The difficulties includes hand washing, mouth hygiene, etc. A survey conducted by The Ministry of Health and Welfare (2012) investigated that the school children in Taiwan have higher rate of teeth decay than the standard set by WHO. In the current curriculum, the time of hygiene education regarding teeth and hand washing is very limited and makes it difficult to change first graders' behavior. Behavior change is not able to obtain instantly that needs constant practice and strengthen (Houle, 1982). Moreover, in the current curriculum, hygiene education is usually in a regular classroom with traditional learning materials that can hardly attract students' attention and make individual practice possible. Although there are computer-aided learning materials available on the web, the materials lack a sense of reality because they are controlled by mouse only.

The game-based learning environment is able to maintain students' attention and further stimulate their learning motivation (Hao, Hong, Jong, Hwang, Su, & Yang, 2010). Movement-based games enable intuitive manipulation that control games by body movements instead of keyboards and mouse. Movement-based games have been applied in motor skills and surgery training (Verdaasdonk, Dankelman, Schijven, Lange, Wentink & Stassen, 2009). However, game-based learning does not guarantee better learning effects than traditional teaching (Kuo, 2007). It is recommended to obtain the balance of entertainment and education.

The Input-Process-Outcome learning model brought by Garris (2002) emphasizes the importance of taking entertainment and education into consideration. The game-based learning needs appropriate content input and outcome. The study further combined movement-based games and cooperative learning in the game-based learning environment. Cooperative learning is usually used to improve interaction and learning (Jocob, 1999; Lewis, Robinson, & Hays, 2011).

In sum, because of the importance of elementary students' hygiene knowledge improvement, the importance of taking learning model and entertainment into consideration, and combining cooperative learning to improve interaction, this study developed a movement-based game designed according to Input-Process-Outcome in a cooperative learning environment to enhance the performance of elementary students' hygiene knowledge developing.

Methodology

The research was conducted in elementary classes in Taiwan and 106 students participated. A total of 44.23% of them were male and 55.77% were female. All students in the research were required to learn through movement-based games and participate in Team-Games-Tournament activities. The content in the movement-based games were highly related to the course content to help participants understand and review what they have learned from the class. The entire treatment lasted for four weeks. In the study, quantitative data consisted of pre-test and post-test scores. The participants were asked to take the pre-test before the treatment. After the treatment, they were asked to take post-test.

Results and Discussions

Dependent t-test was used to answer research question one "In the cooperative learning environment, whether the students in the movement-based game that was designed based on the Input-Process-Outcome model will improve their hygiene knowledge?" The pre-test and post-test were administered to the students in the experimental group at the end of the four weeks of study in order to answer this research question. There is a statistically significant mean difference ($t= -11.65$, $df=53$, $p<.01$) between pre-test and post-test in the IPO-MBGCL group. The posttest score (mean= 85.66, s= 12.80) was higher than the pre-test score (mean= 57.33, s=12.88). The 95% Confidence Interval suggests the true mean difference is included in $-33.20<\mu<-23.45$.

Independent t-test was used to answer research question two "In the movement-based gaming and cooperative learning environment, is there any difference in the learning outcome between the students in or not in the movement-based game that was designed based on the Input-Process-Outcome model?" The pre-test and posttest were administered to the students at the end of the four weeks of study in order to answer this research question. The results from the pre-test showed that there was no

statistically significant difference in the pre-test between IPO-MGBCL and non-IPO-MGBCL groups (t=.78, df =104, p=.44). The 95% Confidence Interval indicates the true mean difference (-.38) may range from -2.95<μ<6.78. On average, participants in the IPO-MGBCL group (M=57.33, SD=12.88) had similar level of prior knowledge before the treatment (M=59.25, SD=12.37). The results are shown below in Table 1.

Table 1. Scores of the Pre-test

Groups	Mean	Std. Deviation	N
IPO-MGBCL	57.33	12.88	54
Non- IPO-MGBCL	59.25	12.37	52
Total	58.27	12.61	106

The results from the knowledge post-test showed that there was statistically significant difference in the post-test between IPO-MGBCL and non- IPO-MGBCL groups (t=-5.35, df =104, p<0.01). The 95% Confidence interval indicates the true mean difference (-14.41) may range from -19.75<μ<-9.07. On average, participants in the IPO-MGBCL group (M=85.66, SD=12.80) performed better academically than the non- IPO-MGBCL group (M=71.25, SD=14.87). The results are shown below in Table 2.

Table 2. Scores of the Knowledge Post-test

Groups	Mean	Std. Deviation	N
IPO-MGBCL	85.66	12.80	54
Non- IPO-MGBCL	71.25	14.87	52
Total	78.59	15.57	106

The results from the motion post-test showed that there was statistically significant difference in the post-test between IPO-MGBCL and non- IPO-MGBCL groups (t=-5.69, df =104, p<0.01). The 95% Confidence interval indicates the true mean difference (-14.97) may range from -20.20<μ<-9.75. On average, participants in the IPO-MGBCL group (M=84.35, SD=12.60) performed better academically than the non- IPO-MGBCL group (M=69.38, SD=14.48). The results are shown below in Table 3.

Table 3. Scores of the Motion Post-test

Groups	Mean	Std. Deviation	N
IPO-MGBCL	84.35	12.60	54
Non- IPO-MGBCL	69.38	14.48	52
Total	77.00	15.45	106

The purpose of this study was to investigate the effect using IPO-MGBCL in hygiene learning. The findings of this study confirm that IPO-MGBCL facilitates effect of learning hygiene in primary education. In the IPO-MGBCL group, the post test scores demonstrated tremendous improvement from the pretest. From the pre-test scores in this study, there was no statistically significant difference in test scores between IPO-MGBCL and non- IPO-MGBCL S groups. However, the IPO-MGBCL group had a higher knowledge post-test score than the other group. Integrating IPO-MGBCL in learning help improve participants' academic performance. Moreover, the IPO-MGBCL group had a higher motion post-test score than the other group. IPO-MGBCL may be interesting and help students get involved in the learning process, which facilitate users' learning.

Acknowledgement

The current study is part of the research project (MOST 02-2511-S-034-003) supported by Taiwan's Ministry of Science and Technology. The author would also like to acknowledge the insightful suggestions of anonymous reviewers.

References

Garris, R., Ahlers, R., & Driskell, J. (2002). Games, motivation, and learning: A research and practice model. Simulation & Gaming, 33(4), 441-467.

Hao, Y., Hong, J., Jong, J., Hwang, M., Su, C. & Yang, J. (2010). Non-native Chinese language learners' attitudes towards online vision-based motion games. British Journal of Educational Technology, 41(6), 1043-1053.

Houle, B.A. (1982). The impact of long-term dental health education on oral hygiene behavior. The Journal of School Health, 52(4), 256-261.

Jocob, E. (1999). Cooperative learning in context: An educational innovation in everyday classrooms. New York: State University of New York.

Kuo, M. J. (2007). How does an online game based learning environment promote students' intrinsic motivation for learning natural science and how does it affect their learning outcomes? Proceedings of the First IEEE International Workshop on Digital Game and Intelligent Toy Enhances Learning, 135-143.

Lewis, S. V., Robinson, E. H., & Hays, B. G.(2011). Implementing an Authentic Character Education Curriculum, Childhood Education, 87(4), 227-231.

Liu, H. & Chen, L. (2010). A study of school life adjustment of first graders in Yunlin County. Early Childhood Education Research, 2, 107-142. The Ministry of Health and Welfare (2012). Retrieved from http://www.bhp.doh.gov.tw/BHPNet/Web/HealthTopic/Topic.aspx?id=20071225008

Verdaasdonk, E., Dankelman, J., Schijven, M. Lange, J., Wentink, M. & Stassen, L. (2009). Serious gaming and voluntary laparoscopic skills training: a multicenter study, Minimally Invasive Therapy & Allied Technologies, 18(4), 232-238.