Research Paper

Is digital game-based learning appropriate for changing students' perceptions?

ABSTRACT

Present study investigates the effectiveness of digital game-based learning (DGBL) on changing classroom atmosphere as perceived by students. Quasi-experiment was employed to examine the effect of DGBL. Experiments were implemented over the course of half semester (10 weeks). A total of 58 eighth-grade (14–15 years old) students participated in the present study. These students in two Civics and Society classes were randomly assigned to one of two conditions in each school level: experimental groups (incorporating DGBL) and comparison groups (taught using teacher instruction, TI). Structural equation modeling (SEM), and one-way repeated measured ANOVA were exploited to answer the research questions. The results of this study are summarized as follows: (1) The classroom atmosphere questionnaire could be effectively used to measure classroom atmosphere students perceived in two classes. (2) DGBL resulted in mastery classroom atmosphere in the experimental groups as compared with learners receiving TI. The quantitative improvement in classroom atmosphere suggests that DGBL support students to engage in mastery and autonomous learning. The implication and suggestion for future researches in interactive learning environment are discussed in this study.

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Key words: Digital game-based learning, classroom atmosphere, teaching method.

INTRODUCTION

Digital game-based learning

Students have frequently shown that they have more intrinsic motivation and interest in games in contrasts to traditional curricular contents (Prensky, 2003). At present, most students play digital games outside schools, they assume the games as crucial part of lives (Papastergiou, 2009; Vos et al., 2011).

Digital games adoption by schools are thought to be effective mediums for teaching and learning, because they can (a) invoke students' learning motivation (Charsky and Ressler, 2011; Kebritchi and Hirumi, 2008; Klein and Freitag, 2010; Yang, 2012) (b) immerse students in cognitive processes (Huang et al., 2010; Pannese and Carlesi, 2007) and (c) create alternative classroom atmosphere (Ke, 2008).

Classroom atmosphere

Teachers play a vital role in students' learning processes. Classroom atmosphere are "certain kinds of instructional demands, situational constraints, or psychosocial characteristics related to various cognitive and affective outcomes of students"(Ames, 1992: 263). Thus, classroom atmosphere in which teachers impact knowledge will influence students' perception, learning performance, and motivation (Ames, 1992; Maehr and Zusho, 2009). The classroom atmosphere include six dimensions: learning task design, sense of authority, recognition of students, grouping, evaluation, and time allocation (Schunk, 2008; Schunk et al., 2008). These six dimensions are so called T.A.R.G.E.T: task, autonomy, recognition, grouping, evaluation, and time.

Table 1: Descriptive statistics of dependent variable - classroom atmosphere.

	EG	CG
	M (SD)	M (SD)
Pretest	1.62 (0.62)	1.76 (0.58)
Postest	4.14 (0.79)	1.69 (0.66)

Table 2: Test of the effect of CGS on junior high school students.

	SS	df	MS	F	p	η^2
Between groups	86.91	1	86.91	164.13	.00	0.86
Within groups	29.66	56	0.53			

Task dimension involves how difficulty and diversity the tasks are. Authority dimension means how students feel about their degree of autonomy. Recognition dimension includes substantial and spiritual rewards, such as money and praise. Grouping dimension focuses on the number collaborative works students have. Evaluation dimension involves methods used to monitor and assess students learning. Time dimension encompasses the appropriateness of workload, the pace of instruction, and the time allocation for completing work (Schunk et al., 2008). Teachers can manipulate the six principles to shape classroom goal structures.

These six dimensions form two kinds of classroom atmosphere: (a) mastery classroom atmosphere, in which the classroom learning environment focuses on developing students' competence and (b) performance classroom atmosphere, in which the classroom learning environment focuses on demonstrating students' competence. Teachers in mastery classroom atmosphere encourage students to master a variety of learning tasks by their own manners or collaborate with group, and tolerate failure. Furthermore, teachers also allow students to set their priorities and allocate time for completing tasks, and recognition and evaluation are based on effort and progress. Contrary to mastery classroom atmosphere, teachers encourage students to compete and surpass others rather than master tasks, tolerate failure, and thus recognition and evaluation are usually based on grades (Ames, 1992; Murayama and Elliot, 2009; Schunk et al., 2008). According to the feature of DGBL, it may contribute to mastery classroom atmosphere. Therefore, the useful DGBL in changing students' perception of classroom atmosphere is main purpose of the present study.

MATERIALS AND METHODS

There are two classes with 58 eight-grade students who participated in the present study. They were randomly assigned to the experiment and control groups. The classroom atmosphere questionnaire had good reliability coefficient ranged from 0.87 to 0.94. The measurement of classroom atmosphere was taken before and after the course to determine the effectiveness of DGBL. There were 1 dependent variable (classroom atmosphere) and 1 independent variable: teaching method with 2 levels (DGBL and teacher instruction). Due to repeated measure for the same subjects, one-way repeated measure ANOVA was introduced. The course was implemented with the simulation game: "Sim City".

RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics of pre-test and post-test for both EG and CG of junior high school students. Perceived classroom atmosphere by students in different classes were similar in pre-test, but there were apparently differences in post-test. Evidently, the result of pre-test showed no significant differences on classroom atmosphere between two junior high school classes (F=0.077; p = 0.39 > 0.05).

The results of one-way repeated measure ANOVA is shown in Table 2. Significant differences between EG and CG on both school levels were been observed (ps =0.00 < 0.05). As described by Cohen (1988), $\eta^2 \geqq 0.010$ indicates a small effect size; $\eta^2 \geqq 0.059$ indicates a moderate effect size; and $\eta^2 \geqq 0.138$ represents a large effect size. The effects of treatment (PDGBL versus TI) showed large effect size in both school levels.

It was not surprisingly, the conspicuous effect resulted from the substance of the DGBL teaching method. In CG, the students do not only have few chance and time trying to resolve more real problems in groups, but had been evaluated and recognized based on grades. Conversely, students in IG, who had less time worked in the groups, but had been evaluated and recognized based on their efforts for presentation. Reasonably, students in CG felt more sense of control, while students in EG felt more autonomy and support. Consequently, students in EG felt mastery

classroom goal structure than students in IGs.

Conclusions

After DGBL course was implemented, students in EG expressed more autonomy and support than students in CG. The result indicated the classroom atmosphere measurement could be used to appropriately measure junior high school students' perception of classroom atmosphere, after well designed and confirmation of its reliability and validity. Teachers could adopt DGBL and incorporate in Civic and Society classes to form mastery classroom atmosphere and autonomy-support learning environment, and it could promote students to actively engage in learning. To ensure achieving this purpose, problems have to be well chosen at first, and then students must have the chance and time to work in group. Most importantly, students also need to plan and try to resolve it via problem-based digital game. Through this process, their interests and motivation can be evoked, if the resolution does not work, they may find additional resources, then discuss and try repeatedly. Last but not least, they should be given a chance to make presentations in groups, then evaluate and recognize them based on their efforts. These are key points toward successfully nurturing of mastery classroom goal structure.

For future researches, there are some issues worthy of further investigation. Since evaluation in DGBL is not based on grades, future researches could adopt informal evaluation such as paperwork or oral presentation as dependent variable, which is based on their efforts rather than grades. The present study demonstrated that DGBL could successfully incorporated in Civic and Society classes to form autonomy-support classroom atmosphere. Researchers could incorporate DGBL with other courses to examine its effectiveness. Finally, the DGBL teaching method should be implemented extensively, to further investigate the changing curves in perception of students.

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