

Elementary school science teachers' experiences, attitudes and perspectives on digital games and using digital educational games in science classrooms

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Abstract: This study aimed to investigate science teachers' experiences, attitudes and perspectives on digital games and using digital educational games in science classrooms. To this end, a total of 14 elementary science teachers were interviewed. The teachers' narratives obtained by tape-recorded interviews were analyzed qualitatively. Major findings and implications are discussed.

Keywords: digital game-based learning, digital game, science education, in-service teacher

Introduction

In the recent years, digital educational games have been considered as potentially effective and powerful instructional tools [1]. Consequently, digital game-based learning (DGBL) has been highlighted by researchers and educators [2]. In science education, some empirical studies have been conducted to examine the effects of science educational games in school setting [3][4]. These studies have revealed that digital educational games are capable of improving science student content knowledge understanding, inquiry ability and motivation [5].

Many researchers have proposed that games are powerful educational tools if used appropriately [6]. However, digital game-based learning has not been widely adopted in schools by teachers [1]. Undoubtedly, teachers' experiences and perceptions on digital games and their perspectives on the use of digital educational games are crucial to their adoption of digital educational games in classrooms and the success of digital game-based learning. To address this important issue, this study investigated a group of elementary science teachers' experiences and perceptions on digital games and their perspectives on the use of digital educational games in science classrooms.

1. Methods

1.1 Subjects

The subjects of this study are 7 male and 7 female voluntary in-service elementary science teachers (a total of 14 teachers). Their teaching experiences ranged from three to twenty seven years, and all of them hold undergraduate degrees.

1.2 Data collection

This study was conducted to explore a group of elementary science teachers' experiences and perceptions on digital games and their perspectives on the use of digital educational games in science classrooms. To this end, tape-recorded interviews were conducted. The interview questions are listed below:

- Question 1: Have you ever played a computer game? (Understanding science teachers' experiences in playing computer games)
- Question 2: How do you think of playing computer games? (Assessing science teachers' perceptions in playing computer games)
- Question 3: Do you agree that computer games could assist science education? Why? (Assessing science teachers' positions regarding the use of digital educational games in science classrooms)
- Question 4: Have you ever employed any computer game in your science classes? If so, how did you apply it? (Assessing science teachers' experiences regarding the use of digital educational games in science classrooms)
- Question 5: What are the possible advantages or disadvantages for students' learning if employing educational computer games in science classrooms? Why? (Assessing science teachers' perspectives regarding the use of digital educational games in science classrooms)

1.3 Data analyses

After the tape-recorded interviews, the narratives of the participants are transcribed and, then, were analyzed qualitatively.

2. Major findings and discussion

2.1 Science teachers' experiences in playing computer games and perceptions in playing computer games

This study explored the science teachers' experience of playing computer games. All the participants stated that they had played computer games. Four teachers only had little experience of playing computer games, while two teachers had very much experience.

Table 1. Teachers' attitudes toward playing computer games

	N (%)
Positive	8 (57.14%)
Negative	3 (21.43%)
Neutral	3 (21.43%)

As revealed in Table 1, more than a half of the interviewed teachers showed positive attitudes toward playing computer games. It should be noticed that three teachers had neutral attitudes toward playing computers. To sum, most of the teachers did not show negative attitudes toward playing computer games.

2.2 Science Teachers' positions regarding the use of digital educational games in science classrooms

Table 2 showed that most of the teachers in this study agreed with the use of digital games in science classrooms. Those agreed with the use of digital games in science classrooms proposed that use of digital games in science classrooms could encourage student motivation and improve their learning outcomes, while the only one teacher who disagreed with the use of digital games stated that if the digital games were just used as quizzes. Moreover, two teachers holding neutral position mentioned that proper digital games were still not available.

Table 2. Teachers' positions regarding the use of digital educational games in science classrooms

	N (%)	Reason
Agree	11 (78.57%)	Encouraging motivation (n=8), Improving learning outcomes (n=5)
Disagree	1 (7.14%)	Poor usage of digital games
Neutral	2 (14.29%)	Unavailability of suitable digital games

2.3 Science teachers' experiences regarding the use of digital educational games in science classrooms

In this study, science teachers' experiences regarding the use of digital educational games in science classrooms were also explored. It was found that a half of the participants (n=7) had ever employed computer games for science teaching, while a half of the participants (n=7) had not yet.

Most of the teachers having the experiences regarding the use of digital educational games in science classrooms mentioned that they used the digital educational games as instructional tools, such as teaching materials demonstrated by teachers or supplementary learning materials (n=4), while the other teachers employed computer games in their science classrooms as assessment tools (n=3).

Those who had not employed computer games for science teaching mentioned that because instructional time was insufficient they were not able to make use of digital educational games in their science classrooms. They also mentioned that the use of digital educational games may encourage learners' motivation.

2.4 Science teachers' perspectives regarding the use of digital educational games in science classrooms

The science teachers in this study also mentioned the possible advantages or disadvantages for students' learning if employing educational computer games in science classrooms. Their responses were summarized in Table 3. According to Table 3, three major advantages were mentioned by the teachers. The advantage most frequently mentioned by the teachers is that the use of educational computer games in science classrooms will encourage students' learning motivation. The second advantage most frequently mentioned by the teachers is that the use of educational computer games in science classrooms can be used as supplementary materials to support students' abstract thinking and promoting their conceptual understanding. Also, some teacher mentioned that educational computer games can be used for students' adaptive learning after school.

Table 3. Teachers' perspectives regarding the use of digital educational games in science classrooms

		N (%)
Advantages	Encouraging motivation	12 (85.71%)
	Enriching learning materials	6 (42.86%)
	Students' adaptive learning after school	2 (14.29%)
Disadvantages	Addiction in playing digital games	2 (14.29%)
	Uninterested in other learning materials or teachers' instruction	3 (21.43%)
	Healthy considerations	1 (7.14%)

The science teachers in this study also pointed out some disadvantages of the use of educational computer games in science classrooms. For example, they were afraid that students may have addiction in playing digital games. Also they were afraid that students might only interested in the educational computer games used in science classrooms, and uninterested in their teaching or other learning materials. In sum, according to the possible advantages or disadvantages proposed by the teachers, it seems that the teachers might have poor understanding of educational computer games. As a result, they stated surface advantages or disadvantages of digital game-based learning.

3. Conclusions

This study explored elementary science teachers' experiences, attitudes and perspectives on digital games and using digital educational games in science classrooms. The findings of this study may provide some insights for teacher educators or educational game developer. This study revealed more than a half of the science teachers had positive attitudes towards digital games, and most of them agreed with the use of digital educational games in science classrooms. However, only a half of the science teachers had ever made use of digital educational games in their science classrooms. According to the possible advantages or disadvantages proposed by the teachers, it seemed that teachers in this study had poor understanding regarding digital game-based learning. To promote the implementation of digital game-based learning in science classroom, more digital educational games designed for science learning will be needed. Besides, to get deeper understanding regarding digital game-based learning, science teachers should be provided more opportunity to experience digital educational games. Also, teacher professional development regarding DGBL in science education will be crucial.

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