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The ECE Pre-service Teachers' Perception on Factors Affecting the Integration of Educational Computer Games in Two Conditions: Selecting versus Redesigning*

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Abstract

This case study aimed to examine early childhood education (ECE) pre-service teachers' perception on the factors affecting integration of educational computer games to their instruction in two areas: selecting and redesigning. Twenty-six ECE pre-service teachers participated in the study. The data was collected through open-ended questionnaires, interviews, the ECE pre-service teachers' lesson plans, and information about educational computer games they selected and redesigned. Open coding analysis was conducted to analyze open-ended questionnaires and interviews. Moreover, the ECE pre-service teachers' lesson plans and information about educational computer games selected and redesigned were analyzed through the defined categories by experts. The results of the study showed that there were differences between the ECE pre-service teachers' educational computer game integration decisions when they selected and redesigned the games. The ECE pre-service teachers stated that the reasons for these changes were the effects of course activities and game characteristics.

Key Words

Educational Computer Games, Technology Integration, Early Childhood Education, Selecting, Redesigning.

The countries invested in the education of young children will collect the benefits in the future by having literate citizens. According to Ball (1994), high-quality early childhood education leads to young children having high-quality provision. Teacher supervision is very important for providing young children with a high-quality education (Ginsburg, 2007). According to Ertmer, Conklin, and Lewandowski (2001), undergraduate teacher education programs are very important for preparing teaching candidates for future teaching. On the other hand, in Turkey, early childhood teacher education program gain improtance in 2006 (Haktanır, 2008). According to Haktanır, the year 2006 was a milestone for early childhood education in Turkey, since the new Early Childhood Teacher Education program was implemented with the work of different universities and the Council of Higher Education in this year. Moreover, in the same year, the Ministry of National Education, General Directorate of Teacher

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Training and Education (2006) announced a set of teaching profession general competencies. These competencies emphasize that a teacher should have content knowledge (CK) and Technological Pedagogical Content Knowledge (TPACK) (Tokmak Sancar, Yelken Yanpar, & Konokman Yavuz, in press). TPACK, which is the framework, emphasizes the pre-service teachers' technology integration skills (Mishra & Koehler, 2006).

The teacher competencies about effective integration of technology and the responsibility of teacher educators to provide experiences for it are pointed out by many researchers (e.g. Ertmer et al., 2001; Bhattacherjee & Premkumar, 2004; Demir, 2011; Govender & Govender, 2009; Kabaca, 2013; Plowman, McPake, & Stephen, 2010; Psycharis, Chalatzoglidis, & Kalogiannakis, 2013; Verenikina, Harris, & Lysaght, 2003). Haktanır (2008) states that Early Childhood Teacher Education programs should aim to help early childhood education pre-service teachers gain aptitudes for integrating technology into their instruction, as well. TPACK is one of the frameworks that can be used as a theoretical base for providing experiences to pre-service teachers to develop their technology integration skills (Yanpar Yelken, Sancar Tokmak, Özgelen, & Incikabi, 2013).

Sancar Tokmak and Incikabi (2013) state that for effective technology integration, two factors should be taken into account by teachers: One is selection of technology; second is how to use it to teach a specific content. Another way to use technology in instruction is to make learners design technology (Koehler & Mishra, 2005). However, in these two conditions (selection and integration or designing and integration), whether or not the teacher's decisions on instructional plan change, and which factors effects their decisions, are limitedly studied in the reviewed literature.

With respect to the above literature, under the scope of two TPACK-based courses in which the study was conducted, this paper aims to investigate how ECE pre-service teachers choose to integrate one of the most popular technologies used for educating young children (educational computer games) in two areas: Selection and redesigning.

Computer Games in Early Childhood Education

Whether the technology should be used or not in early childhood education is not the center of debates now. This debate now focuses on how the technology can be used for the education of young children (Plowman et al., 2010; Verenikina et al., 2003). The use of technology in education was advocated by many scholars such as Verenikina et al. (2003), R. Clements (2004), Cherney and London (2006), and Dwyer (2007). The reviewed literature shows the three reasons for this support. One of the reasons is related to the change in learners' profiles as stated by Albion (2009) and Baek (2009). Today generation is named as "digital natives" or "net generation" (Bennett, Maton, & Kervin, 2008; Ng, 2012), which means a generation familiar with and dependent on ICT (information Communication Technology) (Prensky, 2001). And Baek (2009) claims that this new generation wants to be active during lessons with the help of new technology. The second reason is related to the dissemination of technology in every part of the society. As a result, having members who are able to use and develop technology becomes crucial, and integrating technology into schools is one of the ways to have such members (Kersaint, Horton, Stohl, & Garofalo, 2003). The third reason, as claimed by Miller, Shell, Khandaker, and Soh (2010-2011), and Mishra and Koehler (2006), is that effective technology use can provide for effective learning. In other words, the teachers can integrate technology effectively into their instruction for better learning.

The research studies showed that they are also the most popular home activity among young children (Li & Atkins, 2004; R. Clements, 2004). This claim is supported by Cherney and London (2006), and Dwyer (2007), who claim that outdoor play time is replaced with indoor activities because of computer games. Bopp (2008) states that games have been used for educational purposes since the 18th century; however, with the emergence of computer games, they have become very popular in educational settings. Moreover, Paraskeva, Mysirlaki, and Papagianni (2010) advocated the educational uses of the computer games, and O'Neil, Wainess, and Baker (2005) mentioned benefits of computer games usage in educational setting as: 1) interactivity; 2) motivation; 3) cognitive and affective learning; 4) diverse methods for learning process and outcomes approaches. Sancar Tokmak and Incikabı (2013) state that maybe for that reason, educational computer game use in early childhood education is a very popular research subject.

According to D. H. Clements (2002), research studies show that technology use can contribute to the learning of mathematics by young children. Mioduser, Tur-Kaspa, and Leitner's (2000) studies show that computer-based instruction enhanced the early reading skills acquisition of young children.

Kacar and Doğan (2007) conducted a quasi-experimental research study in which one group of six-year-old children were taught numbers (from 1 to 10) and geometrical shapes (rectangle, circle, triangle, and square) by using educational simulations and computer games, while another group was taught the same subjects using traditional education methods. The result of their study showed that the experimental group was more successful than the traditional one (Kacar & Doğan).

In summary, the literature on computer game use in early childhood reviewed advocates the use of these technologies for teaching young children. However, the computer game selection and integration decisions are emphasized as the important factors that affect the success.

The Theoretical Framework: TPACK

TPACK is described as "a body of knowledge teachers needed for teaching with and about technology in their assigned subject areas and grade levels" by Niess et al. (2009, p. 7). This framework is based on the idea that teaching a specific content with the help of technology effectively requires teachers' use of a combination of these three areas (Mishra & Koehler, 2006). This framework includes seven areas, such as Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and TPACK (Albion, Jamieson-Proctor, & Finger, 2010; Mishra & Koehler; Özgün-Koca, Meagher, & Edwards, 2010; Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). Mishra and Koehler also state that some technologies can be limited to represent a specific content and or application of some teaching strategies. For that reason, technology characteristics and knowledge of technology use is important for effective teaching with technology.

In this case, the technology is computer games which the youngest children play. According to Van Eck (2006), there are three approaches that educators use to integrate computer games to their instruction: "have students build games", "build games and use their own game for instruction", and "select the commercial games and integrate them for instructional purposes." Parallel approach categorizations were done by Kafai (2006) with different names: Instructionist and Constructionist. According to her, in the Instructionist approach, instructors select a commercial game and use it for instructional purposes. In Constructionist approaches, instructors give students a chance to construct their own computer games (Kafai). Similarly, Miller et al. (2010-2011) describes two models for computer games integration with instruction: First, the input-process-outcome (IPO) model, and second, the input-process-outcome for game development (IPO-GD). In the first model, they describe how to learn by playing computer games; in the second model, they describe how to learn by developing computer games (Miller et al.). When existing computer games are integrated with the instruction offered to the pre-service teachers, the selection of computer games becomes important (Liu & Lin, 2008; Sancar Tokmak & Incikabi, 2013), since the characteristics of these tools are affected by the effectiveness of instruction (Van Eck, 2006). Moreover, according to Mishra and Koehler (2006), the technology effects integration decisions. When a computer game is integrated by having the pre-service teachers develop computer games, the characteristics of the games are defined by the pre-service teachers. For that reason, the two TPACK-based courses were designed. In the first one, the ECE pre-service teachers selected computer games and prepared lesson plans; in the second one, they redesigned these computer games and prepared lesson plans. Whether their computer game integration decision changed and what factors affected it were investigated. In line with the purpose of this research, the following research questions were aimed to be answered in the study:

- How do the ECE pre-service teachers decide to integrate educational computer games when they select them?
- How do the ECE pre-service teachers decide to integrate educational computer games when they redesign them?
- What do the ECE pre-service teachers think about the factors affecting their decisions about computer game integration?

Method

The case study design was followed in this study. According to Hamilton (2011), "a case study approach is often used to build up a rich picture of an entity, using different kinds of data collection and gathering the views, perceptions, experiences and/or ideas of diverse individuals relating to the case." Moreover, Yin (2003) states the case studies can be divided into two categories of single case or multiple cases. In the current study, a single case

of the perceptions of ECE pre-service teachers on the computer game decisions, and factors affecting their decisions under two different conditions, were investigated. For that reason, it was a single case study design. The open-ended questionnaire, interviews, the ECE pre-service teachers' lesson plans, and educational computer games they selected and redesigned were conducted to collect data.

Sampling

The purposive sampling strategy was used to select the participants of the study. The participants knew about the learning theories, their field curriculum, and lesson plan preparation. Twenty-six Early Childhood Education Department pre-service teachers who met all the above criteria participated to the study. All the participants were in their 2nd year at university. Five of them were males, while twenty-one of them were females. The ECE pre-service teachers' ages ranged from 18 to 23, with the average of 20.35. The mean of their GPA was 3.01. Their average computer use was seven hours in a week. Moreover, ECE pre-service teachers' computer game play time ranged from one to eight hours a week, with an average of two hours in a week. The ECE pre-service teachers answered questions about the types of computer games they played, and listed Mario, Tetris, puzzle, car racing, sports, and strategy games such as Counter Strike and Age of Empires.

Procedure of the Study

The study lasted 14 weeks, and the procedure included three main steps as: 1) Investigating of the national early childhood curriculum: preparing reports on learning philosophy of curriculum, selecting a topic, preparing a report on aims and activities for teaching related to the selected topic; 2) Selecting computer game and integration to instruction: searching computer games, selecting a computer game on topic taught, and preparing lesson plans to teach topic with help of selected computer game; 3) Redesigning computer game and integration to the instruction: redesigning a computer game to teach selected topic, and preparing lesson plans to teach topic with help of redesigned computer games. The activities were designed according to TPACK framework. The procedure of the study with respect to the main steps designed according to TPACK, and instrument conducted was shown in table 1.

Instruments

The instruments applied during the study were developed by the researcher and checked by two experts. One expert was from the Educational Sciences Department and one of her research interests has been technology integration, while the other expert was from the Computer Education and Instructional Technology Department and her research interest has been technology integration in early childhood education. The instruments as follows:

Demographic Questionnaire: This open-ended questionnaire consisted of eight questions. These eight questions asked about the respondents' age, gender, department, class level, GPA, home computer usage hours in a week, computer game play hours in a week, and the types of computer games they played.

Open-Ended Questionnaire: This open-ended questionnaire was applied at the beginning of the course to learn what the ECE pre-service teachers thought about characteristics of the educational computer games and their integration with the instruction. There were three questions: 1) What do you think about the educational computer games characteristics that can be used for the education of young chil-

Table 1.
The Main Steps of the Procedure with Activities, TPACK, and Instruments Conducted

Steps	Activities	TPACK	Instruments Conducted
Investigating the national early childhood curriculum	preparing reports on learning philosophy of curriculum	PK	Demographic questionnaire Open-ended questionnaire
	selecting a topic,	CK	
	preparing a report on aims and activities for teaching related to the selected topic	PCK	
Selecting computer game and integration to instruction	searching computer games	TK	
	selecting a computer game on topic taught	TCK	
	preparing lesson plans to teach topic with help of selected computer game	TPACK	Lesson plans
Redesigning computer game and integration to the instruction	redesigning a computer game to teach selected topic	TPACK	
	Preparing lesson plans to teach topic with help of redesigned computer games	TPACK	Lesson plans Interviews

dren? 2) How do you integrate educational computer games while teaching young children? 3) What are the factors affected your integration decisions of educational computer games to the instruction?

Interview Form: The semi-structured interview form that was applied at the end of the course had four main questions. These questions were: 1) What do you think about the educational computer game characteristics you selected to teach young children? 2) Which characteristics of the educational computer games selected do you change while redesigning it? What is the reason? 3) Is there any difference about your integration of the educational computer games after redesigning it? If there is, please mention the difference? If there is, please mention the reason? 4) What are the difficulties you faced during the selection or redesign of educational computer games?

Lesson Plan Form: The lesson plan form prepared by experts in the Early Childhood Department and used for the School Experience course was applied in the study. There are nine parts: Subject, Theme, Date, Target, Time Frame, Learning Objectives, Materials Used, Classroom Activities, and Evaluation.

Data Analysis

The data collected through the demographic questionnaire was analyzed by conducting descriptive statistics. The open-ended questionnaire and interviews were analyzed by applying open coding method. Interviews with seven ECE pre-service teachers were transcribed before analysis. Then, as Patton (1990) suggests, all the data collected through open-ended questionnaire and interviews were coded into common themes, patterns, categories, and generalizations. The themes that emerged from the analysis of the data were merged to explore the ECE pre-service teachers' perceptions on factors affecting the game integration decisions. Moreover, the selected and redesigned computer games and lesson plans of ECE pre-service teachers were analyzed under predefined categories. These predefined categories were formed by taking experts' opinions. These categories for game design are: aims, colors, characters, feedback, motivation, target group. The categories formed for analysis of lesson plans are: the aim of the instruction, the philosophy applied, the purpose of using computer game, in which parts of instruction they are going to be used.

Validity Reliability Issues

In the study, validity reliability strategies described by Creswell (2003) were used, such as: triangulation, external audits, members check, and thorough description of the context. The triangulation was applied using three data collection methods: open-ended questionnaires, pre-service teachers' lesson plans, and interviews. External audits were conducted by taking the experts' opinions during instrument development, design of the study, and data analysis. Member checks were used to analyze data, and themes that emerged from the data analysis were verified by another researcher.

Results

Integration of Computer Games When the ECE Pre-service Teachers' Select Them (Research Question 1)

According to the results of the analysis of the lesson plans, most of the ECE pre-service teachers (n=22) planned to teach mathematics to the young children, while four of them planned to teach colors and cleaning. The lesson plan analysis showed that the pre-service teachers planned to teach numbers from one to ten (n=10 pre-service teachers), matching the objects (n=6 pre-service teachers), cleaning (n=3 pre-service teachers), basic operations (3 pre-service teachers), geometry (n=2 pre-service teachers), meronymy (whole-pieces concept; n= 1 pre-service teacher), and colors (n=1 pre-service teacher). In the interview the pre-service teachers were asked why they mostly prefer teaching mathematics topics, and the pre-service teachers stated that the reason was their familiarity with the mathematics program in ECE curriculum, since they had studied it during Teaching Mathematics to Young Children course.

Also, the lesson plan analysis showed that twenty-two of the ECE pre-service teachers planned to teach topics they selected by following a behaviorist learning philosophy, while four of them planned to teach the topics they selected by following a constructivist learning philosophy. Twenty-two ECE pre-service teachers who planned to apply a behaviorist philosophy started the lesson by giving information about known objects such as trees, cars, and clouds, and used music, plays, cartoons, coloring books, storytelling, and tongue twisters while teaching the subject matter. For example, one of the ECE pre-service teachers who planned to teach numbers to young children started the lesson by counting the number of objects in the classroom. Then, she planned to hide

some objects with numbers labeled on them in the classroom, and wanted children to find these numbers. According to her lesson plan, this pre-service teacher planned to use the *Croak Croak* computer game for assessing children's learning.

The other four ECE pre-service teachers, who planned to follow a constructivist philosophy, used known objects and asked children about these objects, or developed activities to provide the children with an understanding of the subject matters being taught. They planned to use music, plays, cartoons, coloring books, and storytelling during the lesson. For example, one of the pre-service teachers who planned to teach cleaning concepts to the young children started the lesson by having the children play with bouncing putty first. Then, she planned to distribute a worksheet which included dots on it, and wanted the children to connect these dots. Since the picture that emerged as a result of connecting the dots would be of children, she planned to ask questions about the picture. Then, she wanted the children to color the picture with finger paint, according to her lesson plan. The lesson plan analysis of this pre-service teacher also showed that she wanted the children to wash their hands and continue the lesson with a story, which was called "Little Stars," and finished the lesson by having the children play *Color the Children,* a computer game. Table 2 shows the statistics of topics and learning philosophies the ECE pre-service teachers preferred to prepare lesson plans.

Table 2.
The Topics and Learning Philosophies in the ECE Pre-service Teachers' Lesson Plans

Topic Taught	Learning Philosophy		N
	Behaviorist	***Constructivist***	
Numbers	9	1	10
Matching the objects	6	0	6
Cleaning	2	1	3
Basic operations	2	1	3
Geometry	1	1	2
Meronymy	1	0	1
Colors	1	0	1
TOTAL	**22**	**4**	**26**

The ECE pre-service teachers who planned to apply a behaviorist philosophy used computer games for assessing young children's learning or improving their learning of the topic taught. The results showed that fourteen ECE pre-service teachers used computer games to assess children at the end of the lesson, while eight of them used the computer games to practice what the children learn about the topic taught.

The pre-service teachers who planned to apply a constructivist philosophy used computer games to assess children at the end of the lesson, improving their learning of the topic taught, or to make the young children understand the topic taught. Two ECE pre-service teachers planned to use computer games to assess the children, while one of them used the computer games to encourage them to learn. Only one ECE pre-service teacher planned to use computer games to make children understand the content of the lesson. Table 3 shows the statistics of the ECE pre-service teachers with respect to the learning philosophies and game integration decisions applied when they selected computer games.

Table 3.
The Numbers of the ECE Pre-service Teachers according to Learning Philosophies and Game Integration Decisions in their Lesson Plans When They Selected Computer Games

Learning Philosophy	Game Integration			N
	Assessing Learning	***Practicing Learning***	***Realizing the topics***	
Behaviorist	14	8	0	22
Constructivist	2	1	1	4
TOTAL	**16**	**9**	**1**	**26**

Integration of Computer Games When the ECE Pre-service Teachers' Redesign Them (Research Question 2)

"Analysis of the results of the ECE pre-service teachers' lesson plans showed that sixteen of them applied a constructivist learning theory, while ten of them prepared their plans based on a behaviorist theory." Moreover, according to analysis of the lesson plans, the ECE pre-service teachers who planned to apply a constructivist theory integrated computer games which were redesigned mostly at the beginning of the lesson for helping children understand the topic taught (n=8), then, assessing children's learning (n=5), assessing their prior knowledge (n=2), and helping them practice the topic (n=1). On the other hand, the ECE pre-service teachers who planned to apply a behaviorist theory integrated computer games at the end of the lesson in order to assess what the children learned (n=5), and to help them practice the topic taught (n=5). Table 4 shows the statistics of learning philosophies and game integration decisions that the ECE pre-service teachers made in their lesson plans when they redesigned computer games.

Table 4.
The Numbers of Learning Philosophies and Game Integration Decisions that the ECE Pre-service Teachers Followed in Their Lesson Plans When They Redesigned Computer Games

Learning Philosophy	Game Integration				N
	Assessing Learning	*Practicing what learned*	*Realizing the topics*	*Assessing the prior knowledge*	
Behaviorist	5	5	0	0	10
Constructivist	5	1	8	2	16
TOTAL	**10**	**6**	**8**	**2**	**26**

Ten ECE pre-service teachers were interviewed about their choices of computer game integration into their lessons in the two conditions, when they selected the computer games and when they redesigned the selected computer games. Moreover, according to what they decided the learning philosophy applied and computer game integrated. The categories created as a result of "course activities," with sub-categories, "learning to look from another perspective", "learning from friends" and "reflections about lesson plans"; "game characteristics" with sub categories "differences of selected games and redesigned games in terms of", design, target children, scenarios, and suitability to the content. Table 5 shows the categories created as a result of the data analysis of interviews about the factors affecting ECE pre-service computer game integration decisions.

Table 5.
The Categories Emerged as a Result of the Data Analysis of Interviews about the Factors Affecting ECE Pre-service Computer Game Integration Decisions

Main Categories	Sub-Categories
Course activities	· learning to look from another perspective · learning from friends · reflections about lesson plans
Game characteristics	· not suitability of selected games to young children · Changed the selected in terms of: * Design (colors, shapes, pictures etc.) * scenarios, * logic of playing * characters, * levels, * points * feedback

The pre-service teachers emphasized that the course activities were based on seeing and discussing the lesson plans, the computer games selected and the computer games redesigned by the ECE pre-service teachers. According to them, all of these activities gave them opportunity to see classmates' lesson plans and their perspectives, and to learn from each other. Moreover, they said that the ideas about lesson plans provided by instructors made them think about other integration options for the computer games. One ECE pre-service teachers stated that:

I learned many things during the course. At first I could not think of any different options to integrate the computer game I selected, and preferred to use it for assessing children's learning. However, I realized that I can use it for different purposes. Actually, the game design a bit restricted me. I might integrate it for practicing the lesson.

The other factor affecting the ECE pre-service teachers' game integration decisions was computer games characteristics. According to most of the ECE pre-service teachers, the children should know the topic (that is being taught with the computer game selected) to play the computer game selected. For example, one of the ECE pre-service teachers pointed out that:

The game I selected is designed on basic operations. There is a lake and during the game, different numbers of ducks are going in the lake and going out of the game. The children can discover the number of ducks in the lake by adding or subtracting. The children should know addition or subtraction to play the game. So, how could I integrate this game to the lesson plan? Of course, I can integrate it after teaching the basic operations.

Moreover, most of them redesigned the logic, scenarios, characters, levels, points, and feedback of the computer games they selected according to the comparisons of selected and redesigned computer games analysis. The selected and redesigned computer games were analyzed in terms of the redesigned parts by the ECE pre-service teachers. The results of the computer games analysis supported the interview results in that all the pre-service teachers changed the design of the computer games. The most changed parts in the designs were colors, texts, placement of score table, and objects on the interface of the computer games.

The results of the interview analysis showed that all the pre-service teachers stated that the computer games should have been redesigned. All of them emphasized that computer games were not suitable for young children in terms of different parts such as design (colors, shapes, pictures etc.), scenarios, characters, levels, points, and feedback. Some of the ECE pre-service teachers explained that they changed the design of the computer games, such as colors and pictures, while some of them changed scenarios, characters, level options, point collection, and feedback options. One of the ECE pre-ser-

vice teachers stated that (shown in Figure 1 and 2):

The computer game I selected was not in our language. I changed the logic of playing, point part, feedback, and the characters. In the game I selected, the children did not have to do anything. In the game, there was a bee with a honey pot, and square geometrical shapes were falling on this bee. When the bee collected a geometrical shape, a voice said the name of this geometrical shape. Also, for each collected geometrical shape, the children gain one point, but there was no feedback. In the redesigned version, I used a butterfly as a character, and there was a geometrical shape near the point. The geometrical shapes were falling from the tree, the children tried to touch the shown geometrical shape near the stars (point parts). If s/he could not, the butterfly's color was the same color with the shape touched. Moreover, s/he got stars when s/he touched the right geometrical shapes, and the color of the butterfly did not change. The color change was also a feedback for children.

According to the interview and computer games analysis results, some of the pre-service teachers changed the design of the computer game totally. In other words, the computer games they redesigned and selected have no similarities in general. This ECE pre-service teacher stated:

The game I selected for teaching numbers cannot motivate the children. The children have to do the same things all the time. My design, actually, is much more different than the game I selected; the game consists of three levels and in each level, the children do different activities. Moreover, my design has a scenario, and characters like smurfs. Actually, children do many things such as match the numbers with objects by counting how many objects are in the picture or place the number by counting one to nine.

Figure 3 shows the educational computer game selected by this ECE pre-service teacher. As seen from Figure 3, there are cats and milk in the dishes in the first screen. The children are asked, "How many dishes are the cats given to feed them?" If the children can count and select the correct number of dishes, a screen in which the cats are drinking milk from the dishes appears. If the children give the wrong answer, there is a sign that shows a wrong answer is given.

In the redesigned version of the game, the ECE pre-service teacher changed the game totally. In the game she redesigned, there is a scenario, and the characters are smurfs. In figure 4, which shows the 2nd level of the game (screen I), the children started the game. Then, the game starts (screen II), and in this level the children are told to count the objects in the picture, which is of smurfs collecting smurf strawberry in the forest, and place the correct number on one of the objects. If her/his answer is correct, screen III is seen. If her/his answer is wrong, the smurf with a worry face is seen on the screen. The screen design was a setting, such as the smurfs' village, or the forest. Moreover, the children have to select, enter, or drag and drop to play the computer game.

Shortly, the results of the study showed that the ECE pre-service teachers' decisions about the integration of computer games changed according to their knowledge of integration options, and the characteristics of computer games. Most of the pre-service teachers stated that during the course they took, they learned about other integration options from friends and instructors, and also critically evaluated the computer games. Moreover, they emphasized that the game characteristics restricted their computer game integration decisions. According to them, most of the computer games were not designed in line with ECE curriculum. For that rea-

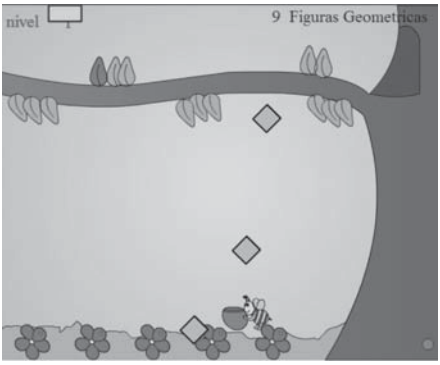


Figure 1.

The Screenshot of the Selected Computer Games by an ECE Pre-Service Teacher

Figure 2.

The Screenshot of the Redesigned Computer Games by an ECE Pre-Service Teacher

son, the redesigned games were much more different than selected ones.

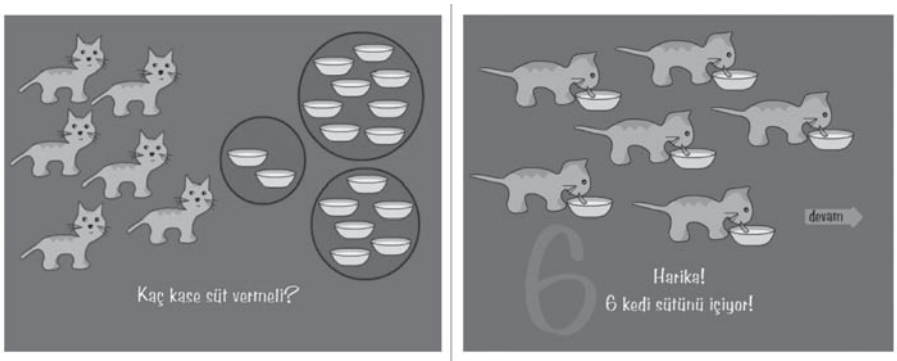
Discussion and Conclusion

Sancar Tokmak and Incikabi (2013), Van Eck (2006) pointed out the importance of selecting suitable computer games for teaching. Moreover, Mishra and Koehler (2006) states that some technology limitedly presents the subject matter being taught, while describing the Technological Content Knowledge (TCK), and states the importance of knowledge in selecting and applying the best technological tool for a specific teaching technique while describing Technological Pedagogical Content Knowledge (TPK). In other words, selection and integration, and designing and integration showed that learning philosophy and teaching techniques applied might change since the technology chosen may limit the teaching strategies. The computer game selection/evaluation criteria (Sancar Tokmak, Incikabi, and Yanpar Yelken, 2012), and learning by design computer games (Kafai, 2006; Miller et al., 2010-2011) were researched. However, in the reviewed literature, the factors affecting the integration decisions of the pre-service teachers were not investigated. For that reason, factors affecting the ECE pre-service teachers' integration decisions of computer games were investigated under two conditions. In the first condition, the ECE pre-service teachers selected and integrated the computer games. In the second condition, the pre-service teachers redesigned and integrated the computer games. The participants of the study were twenty-six ECE pre-service teachers who registered for the Instructional Technology and Material Design course, and knew about selection/evaluation of educational computer games, and teaching strategies/lesson plan preparation.

The results of the study showed that all the ECE pre-service teachers stated that they realized that the selection of educational computer games was a very difficult process since most of the computer games, even those selected to teach young children, were not suitable for learning objects, targets, or any subject matter they planned to teach. The analysis of the selected and redesigned educational computer games supported this result in that all the ECE pre-service teachers made changes in educational computer games during the redesign activity. Liu and Lin's (2008) study, in which they evaluated 196 computer games, showed that not all games are suitable for learners. For that reason, they suggested that teachers select educational computer games carefully.

Another results of the study showed that most ECE teachers preferred to integrate educational computer games for assessing what students have learned in a behaviourist approach when they selected the computer games. On the other hand, when they redesigned the educational computer games, they planned to integrate educational computer games mostly for assessing what students have learned and helping students understand the topic in a constructivist approach. According to the ECE pre-service teachers, the reasons for this change in integration were "the effects of course activities" and "computer game characteristics."

The ECE pre-service teachers stated that during the course activities, they learned to look from another perspective about their integration decisions, since they had opportunity to see their classmates' integra-



Screen I **Screen II**

Figure 3.
The Game Selected by the ECE Pre-Service Teachers

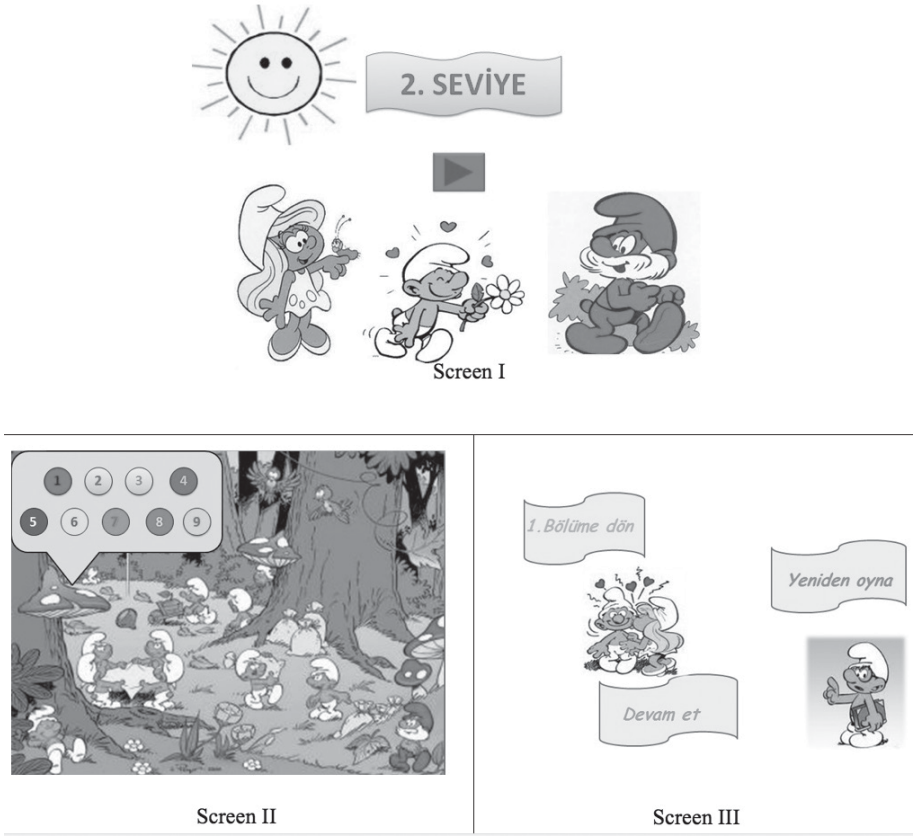


Figure 4.
The Game Redesigned By the ECE Pre-Service Teacher

tion decisions, and learned from their reflections on the lesson plans in the first part of the course. These results are consistent with claims in the literature about the effects of teacher education programs on the development of the pre-service teachers' competencies in effective integration of technology, as stated by Ertmer et al. (2001), Bhattacherjee and Premkumar (2004), Govender and Govender (2009), Plowman et al. (2010), and Verenikina et al. (2003).

The results also showed that, according to the ECE pre-service teachers, game characteristics also affected their computer game integration decisions to instruction. They stated that the computer games selected required students to have pre-knowledge to play. For example, children had to know addition and subtraction process in order to play the computer game on basic operations. For that reason, they stated that they could not integrate these types of games into instruction based on a constructivist philosophy. As Mishra and Koehler (2006) claimed under TPK knowledge description, some technologies supported specific teaching techniques.

This qualitative case study was limited to investigate the ECE pre-service teachers' computer game integration decisions under two conditions. In the future, the factors affecting the computer game integration decisions of ECE teachers who teach in a real classroom may be investigated, since in a real classroom there can be many other factors which may affect the teachers' technology integration decisions, such as student pre-knowledge, classroom infrastructures, and learner-instructor interaction.

References

Albion, P. R. (2009). Virtual spaces for teaching and learning. In D. Gibson & Y. K. Baek (Eds.), *Digital simulations for improving education: Learning through artificial teaching environments* (pp. 52-67). Hershey, PA: Information Science Reference.

Albion, P., Jamieson-Proctor, R., & Finger, G. (2010). Auditing the TPACK confidence of Australian pre-service teachers: The TPACK confidence survey (TCS). In D. Gibson & B. Dodge (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2010* (pp. 3772-3779). Chesapeake, VA: AACE.

Baek, Y. (2009). Digital simulation in teaching and learning. In D. Gibson & Y. K. Baek (Eds.), *Digital simulations for improving education: Learning through artificial teaching environments* (pp. 25-51). Hershey, PA: Information Science Reference.

Ball, C. (1994). *Start right: The importance of early learning*. London, UK: Royal Society of Arts.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39* (5), 775-786.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *Management Information Systems Quarterly*, *28* (2), 229-254.

Bopp, M. M. (2008). *Storytelling and motivation in serious games.* Final Consolidated Research Report of the Enhanced Learning Experience and Knowledge Transfer – Project (ELEKTRA), (European Commission contract number 027986). Retrieved 01.03.2013 from http://ocw.metu.edu.tr/pluginfile.php/4624/mod_resource/content/0/ceit706/week8/MatthiasBopp.pdf

Cherney, I. D., & London, K. (2006). Gender-linked differences in the toys, television shows, computer games, and outdoor activities of 5- to 13-year-old children. *Sex Roles, 54* (9-10), 717-726 (doi:10.1007/s11199-006-9037-8).

Clements, D. H. (2002). Computers in early childhood mathematics. *Contemporary Issues in Early Childhood, 3* (2), 160-181 (doi:10.2304/ciec.2002.3.2.2).

Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood, 5* (1), 160-181 (doi:10.2304/ciec.2004.5.1.10).

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed methods approaches*. Thousand Oaks, CA: Sage.

Demir, S. (2011). Two inseparable facets of technology integration programs: technology and theoretical framework. *Eurasia Journal of Mathematics, Science & Technology Education, 7* (2), 75-88.

Dwyer, J. (2007). Computer-based learning in a primary school: Differences between the early and later years of primary schooling. *Asia-Pacific Journal of Teacher Education*, *35* (1), 89-103 (doi:10.1080/13598660601111307)

Ertmer, P. A., Conklin, D., & Lewandowski, J. (2001, November). *Increasing preservice teachers' capacity for technology integration through use of electronic models.* Presented at the Annual Meeting of National Convention of the Association for Educational Communications and Technology, Atlanta, GA.

Ginsburg, K. R. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics, 119* (1), 182-91.

Govender, D., & Govender, I. (2009). The relationship between information and communications technology (ICT) integration and teachers' selfefficacy beliefs about ICT. *Education as Change, 13* (1), 153-165.

Haktanır, G. (2008). Okul öncesi öğretmeni'nin niteliği. *Eğitime Bakış Eğitim-Öğretim ve Bilim Araştırma Dergisi, 4* (12), 22-35.

Hamilton, L. (2011) *Case studies in educational research, British Educational Research Association on-line resource*. Retrieved January 24, 2013 from http://www.bera.ac.uk/resources/case-studies-educational-research.

Kabaca, T. (2013) Using dynamic mathematics software to teach one-variable inequalities by the view of semiotic registers. *Eurasia Journal of Mathematics, Science & Technology Education*, *9* (1), 73-81.

Kacar, A. Ö., & Doğan, N. (2007, January-February). *Okulöncesi eğitimde bilgisayar destekli eğitimin rolü*. Paper Presented at Akademik Bilişim, Dumlupınar Üniversitesi. Retrieved 01.03.2013 from http://ab.org.tr/ab07/bildiri/43.pdf.

Kafai, Y. B (2006). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture, 1* (1), 34-40.

Kersaint, G., Horton, B., Stohl, H., & Garofalo, J. (2003). Technology beliefs and practices of mathematics education faculty. *Journal of Technology and Teacher Education, 11* (4), 549-577.

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research*, *32* (2), 131-152 (doi:10.2190/0EW7-01WB-BKHL-QDYV).

Li, X., & Atkins, M. S. (2004). Early childhood computer experience and cognitive and motor development. *Pediatrics, 113* (6), 1715-1722.

Liu, E. Z. F., & Lin, C. H. (2008). Developing evaluative indicators for educational computer games. *British Journal of Educational Technology, 40* (1), 174-178 (doi:10.1111/j.1467-8535.2008.00852.x).

Miller, L. D., Shell, D., Khandaker, N., & Soh, L- K. (2010-2011). Teaching using computer games. *Journal of Educational Technology Systems, 39* (3), 321-343.

Ministry of National Education, General Directorate of Teacher Training and Education. (2006). *Teaching profession general competencies*. Retrieved 05.08.2011 from http://otmg.meb.gov.tr

Mioduser, D., Tur-Kaspa, H., & Leitner, I. (2000).The learning value of computer-based instruction of early reading skills. *Journal of Computer Assisted Learning*, *16*, 54-63 (doi:10.1046/j.1365-2729.2000.00115.x).

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108* (6), 1017-1054.

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59,* 1065-1078.

Niess, M. L., Ronau, R. N., Shafer, K. G., Driskell, S. O., Harper, S. R., & Johnston, C. et al. (2009). Mathematics teacher TPACK standards and development model. *Contemporary Issues in Technology & Teacher Education*, *9* (1), 4-24.

O'Neil, H. F., Wainess, R., & Baker, E. L. (2005). Classification of learning outcomes: Evidence from the computer games literature. *Curriculum Journal*, *16* (4), 455-474 (doi: 10.1080/09585170500384529).

Özgün-Koca, A., Meagher, M., & Edwards, M. T. (2010). Preservice teachers' emerging TPACK in a technology-rich methods class. *The Mathematics Educator*, *19* (2), 10-20.

Paraskeva, F., Mysirlaki, S., & Papagianni, A. (2010). Multiplayer online games as educational tools: Facing new challenges in learning. *Computers & Education*, *54*, 498-505 (doi:10.1016/j.compedu.2009.09.001).

Patton, M. Q. (1990). *Qualitative research and evaluation methods* (2nd ed.). Newbury Park, CA: Sage.

Plowman, L., McPake, J., & Stephen, C. (2010). The technologisation of childhood? Young children and technology in the home. *Children & Society*, *24* (1), 63-74 (doi:10.1111/j.1099-0860.2008.00180.x).

Prenksy, M. (2001). Digital natives, digital immigrants. *On the Horizon*, *9* (5), 1-6.

Psycharis, S., Chalatzoglidis, G., & Kalogiannakis, M. (2013) Moodle as a learning environment in promoting conceptual understanding for secondary school students. *Eurasia Journal of Mathematics, Science & Technology Education*, 9 (1), 11-21.

Sancar Tokmak, H., & Incikabi, L. (2013). Integration of the computer games into early childhood education pre-service teachers' mathematics teaching. In S. Keengwe (Ed.), *Research perspectives and best practices in educational technology integration* (pp.178-196). Hershey, PA: IGI Global Publishing.

Sancar Tokmak, H., İncikabi, L., & Yanpar Yelken, T. (2012). Differences in the educational software evaluation process for experts and novice students. *Australasian Journal of Educational Technology*, *28* (8), 1283-1297.

Schmidt, D., Baran, E., Thompson, A., Mishra, P., Koehler, M., & Shin, T. (2009). Examining preservice teachers' development of technological pedagogical content knowledge in an introductory instructional technology course. In G. Ian, W. Roberta, M. Karen, C. Roger, & W. Dee Anna (Eds.), *Proceedings of the Society for Information Technology & Teacher Education International Conference 2009* (pp. 4145-4151). Chesapeake, VA: AACE.

Tokmak Sancar, H., Yelken Yanpar, T., & Konokman Yavuz, G. (in press). Pre-service teachers' perceptions on development of their IMD competencies through TPACK-based activities. *Educational Technology & Society*, *16* (2).

Van Eck, R. (2006). Digital game-based learning: It's not just the digital natives who are restless… *EDUCAUSE Review*, *41* (2), 16-30.

Verenikina, I., Harris, P., & Lysaght, P. (2003). Child's play: Computer games, theories of play and children's development. In *Proceedings of the Young Children and Learning Technologies*. Selected papers from the International Federation for Information Processing Working Group.

Yanpar Yelken, T., Sancar Tokmak, H., Özgelen, S., & Incikabi, L. (2013). Teknolojik-Pedagojik-Alan Bilgisi (TPAB) çerçevesi ve bu çerçevenin milli eğitim bakanliği fen ve matematik eğitimi programindaki yeri. In T. Yanpar Yelken, H. Sancar Tokmak, S. Özgelen, & L. İncikabı (Eds.), *Fen ve Matematik Eğitiminde Teknolojik Pedagojik Alan Bilgisi temelli öğretim tasarimlari* (pp. 1-12). Ankara: Anı Publishing.

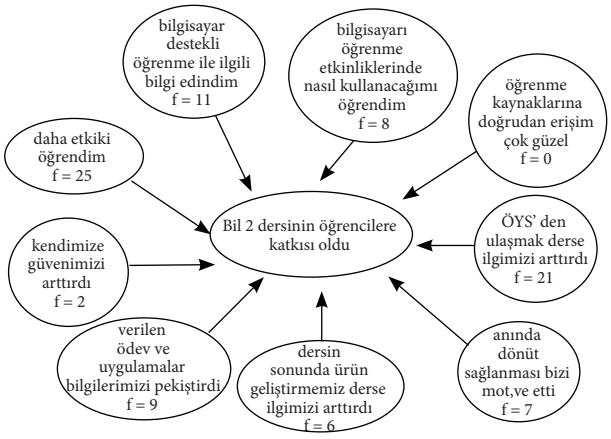
Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

ERRATUM/BASIM HATASI

1.

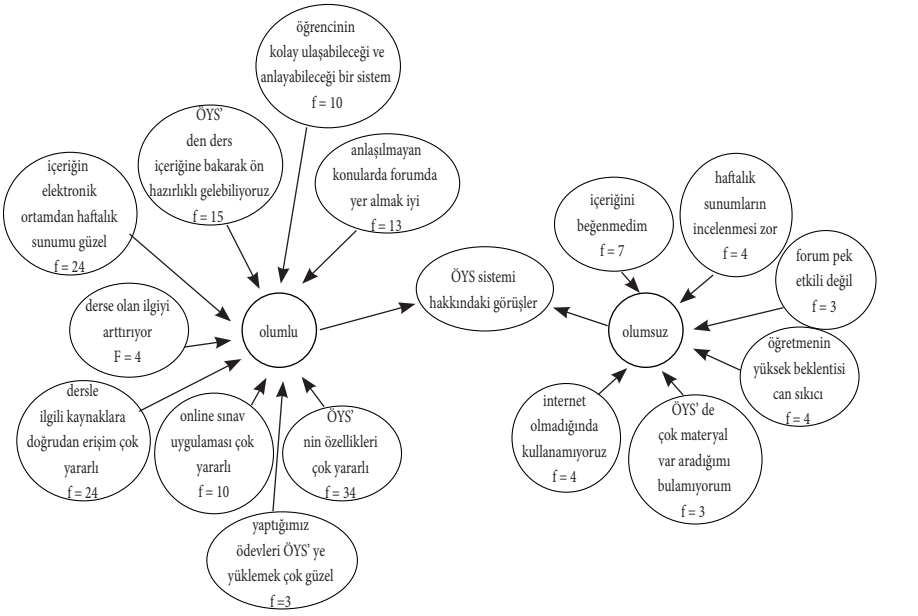
Kuram ve Uygulamada Eğitim Bilimleri Dergisi'nin 12. cilt, 1. sayısında yayımlanan Aynur GEÇER ve Funda DAĞ'a ait "Bir Harmanlanmış Öğrenme Tecrübesi" başlıklı çalışmanın 433. sayfasındaki Şekil 4 ve 435. sayfasındaki Şekil 5, tasarım esnasındaki bir hata sonucu yanlış yayımlanmıştır.

Söz konusu çalışmadaki hatalı şekillerin asılları aşağıda yer almaktadır.



Şekil 4.

Bilgisayar 2 Dersinin, Yüz Yüze ve Elektronik Ortamda Sunulan Öğrenme Materyalleri İle Harmanlanarak Uygulanmasının Öğrencilere Katkısına Yönelik Bulgular



Şekil 5.

Öğrencilerin Derste Kullanılan Öğrenme Yönetim Sistemi (ÖYS)'*nin Özellikleri (İçeriğin Haftalık Sunumu, Forum, Ödev, Çevrim İçi Sınav Araçlarının Kullanımı) ve Genel Olarak ÖYS'nin Kullanımı Hakkındaki Görüşlerine İlişkin Bulgular*

2.

Kuram ve Uygulamada Eğitim Bilimleri Dergisi'nin 13. cilt 1. sayısında yayımlanan Senem SUVEREN ve H. Elif DAĞLIOĞLU'na ait "Okul Öncesi Dönem Üstün Yetenekli Çocukların Belirlenmesinde Öğretmen ve Aile Görüşleri ile Çocukların Performanslarının Tutarlılığının İncelenmesi" başlıklı çalışmanın yazar sıralaması, tasarım esnasındaki bir hata sonucu yanlış yayımlanmıştır.

Söz konusu çalışmanın birinci yazarı Senem SUVEREN'dir.