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EFFECTS OF AN EDUCATIONAL GAME DEVELOPMENT COURSE ON PRE-SERVICE TEACHERS' CONCERNS ABOUT THE USE OF COMPUTER GAMES IN THE CLASSROOM

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ABSTRACT: The main purpose of the present study was to investigate the change in pre-service teachers' concerns about the use of educational computer games in the classroom upon participating in a course on the development of game-like learning environments. The Stages of Concern Questionnaire (SoCQ) based on the Concerns-Based Adoption Model (CBAM) was administered to 31 volunteer 4th year pre-service teachers at the department of Computer Education and Instructional Technology in a public university in Turkey. Instruments were administered before and after attending the course on design, development and evaluation of educational software, of which main objective was the development of game-like learning environments. Peak stage score, first and second stage score and group profile were interpreted on the basis of the manual for the questionnaire. Suggestions and recommendations to overcome pre-service teachers' concern about educational computer games were presented.
Keywords: The Stages of Concern Questionnaire, Educational Computer Games, Pre-service Teachers

1. INTRODUCTION

With the advancement in the capabilities of the computers, today, electronic games have been gaining more and more popularity in educational settings. Computer games are regarded as powerful tools for the development of students' cognitive skills and improving their motivation (Rieber, 1996 ;Akilli, 2007). While students are engaging in completing a task assigned in a computer game, they are compelled to learn central concepts and principles of a topic. Therefore, students take the responsibility for their own learning and become autonomous for their decisions. In this aspect, electronic games can be an innovative way for teachers to use in the classroom.

Teachers' adaptation process affects the use of computer games in education. As one aspect of the adaptation, or change, concern has an important impact on their resistance to change (Dormant, 1999). Therefore, the concerns based on adoption model (CBAM) was taken as a framework for understanding concerns experienced by teachers while they attempt to implement new curriculum materials and instructional practices. As one of the components of CBAM, "Stages of Concern" includes seven stages, namely; awareness (0), informational (1), personal (2), management (3), consequences (4), collaboration (5), and refocusing (6) (Hall & Hord, 2001). Typical expressions of stages of concern about the innovation were depicted in table 1 below.

Table 1: Stages of Concern: Typical Expression of Concern about the Innovation (Hall & Hord, 2001)

Stages of Concern	Expression of Concern
6 Refocusing	I have some ideas about something that would work better.
5 Collaboration	I am concerned about relating what I am doing with what my co-workers doing.
4 Consequence	How is my use affecting clients?
3 Management	I seem to be spending all of my time getting materials ready
2 Personal	How will using it affect me?
1 Informational	I would like to know more about it.
0 Awareness	I am not concerned about it

The purpose of this study was to investigate the change in pre-service teachers' concerns about the use of educational computer games in their future classroom after participating in a course on the development of game-like learning environments. The course was about the design, development and evaluation of educational software, mainly emphasized on the development of game-like learning environment. Since the course was one of the required courses in Computer Teachers' pre-service curriculum, all 4th year students registered to the course. We assumed that the 4th year pre-service teachers' current concerns about the use of the computer games would influence its usage in their professions because it is more likely that their concerns are good predictors of their use in the future.

2. METHODOLOGY

The study included 31 volunteer 4th year pre-service teachers from the department of Computer Education and Instructional Technology. They enrolled in a 14-week undergraduate course on design, development and evaluation of educational software, Table 2 presents the demographics of the students.

Table 2: Characteristic of the students

		N	*P*
Gender			
	Female	14	45,2
	Male	17	54,8
Having own computer			
	No	1	3.2
	Yes	30	96,8
Years of Computer Use			
	4-5 years	3	9,7
	6-7 years	10	32,3
	More than 8 years	18	58,1
Having hardware capacity to play game	Not enough	1	3,2
	Enough for some games	14	45,2
	Enough	16	51,6
Years of playing game			
	I do not play/ have not played game	1	3,2
	Less than 1 year	3	9,7
	2-5 years	11	35,5
	More than 6 years	16	51,6
Playing a computer game for educational purposes	Yes	20	64,5
	No	11	35,5

The Stages of Concern Questionnaire (SoCQ) was used to collect data to investigate if the course on the development game-like learning environments had influence on the concern of pre-service teachers about the use of educational computer games. SoCQ was developed by Hall, George and Rutherford (1977). Students were asked to rate 35 statements, each of which expresses a certain concern about the educational computer game as an innovation, by marking each one on a 0 to 7 scale. "0" indicates very low concerns or irrelevant items, "1" low concern, and "7" high concern. The SoCQ is composed of seven scales representing seven Stages of Concern in the concern theory. Each scale consists of five statements that are representative for a specific stage of concern. The original questionnaire was in English and translated into Turkish carefully by the researchers. The SoCQ was modified by replacing the term "the innovation" with "educational computer games" to increase the comprehensiveness of items.. In this study, the coefficients of internal reliability of SoCQ scales for the second administration varied from to .31 to .82: (a) awareness (.64), (b) informational (.53), (c)

personal (.72), (d) management (.31), (e) consequence (.82), (f) collaboration (.81), and (g) refocusing (.70), whereas Hall, George, and Rutherford (1977) reported that the reliability coefficient for scales range from .64 to .83

At third week of the course, after taking the introductory part for educational computer game, pre-service teachers were asked to fill out the SoCQ to identify their concern about educational computer game felt before the course.. The pre-service teachers were asked to rate the statement as if they were teachers. The course related to game-like learning environment lasted 14 weeks and covers such topics as simulations and games in education, instructional approach to the development of game-like learning environments, game story boarding and blended technologies. In the laboratory session, pre-service teachers also designed and developed an educational computer game with the help of teaching assistants. Moreover, as a course requirement, they were expected to design and develop educational computer game. At the last week of the course, the SoCQ was administrated again to identify pre-service teachers' concern about educational computer games after the completion of the course.

The data were analyzed and interpreted through the means of procedures prescribed in the manual for the use of SoCQ by Hall, George, and Rutherford (1977). Based on this manual, the raw score for each scale was calculated by summing the rates to the five statements on that scale. When the seven raw scale scores were obtained, they were converted into percentile scores. With the raw and percentile scores for seven stages, means and percentiles for each stage, and the frequency of highest individual score on each stage were reported to interpret the data.

3. RESULTS

3.1. Peak Stage Score Interpretation

In order to find the highest stage score (peak stage score) for group data, the number of individuals that were high on each stage was calculated for pre and post tests and range of highest stage scores within the group was found in the both tests. The higher number of individuals at a stage is, the more intense the concern at that stage is, and vice versa. Accordingly, before the course the highest stage of concern for the pre-service teachers was Stage 1 (informational) (see Table 3). This means that before the course the pre-service teachers want more information about educational computer games. On the other hand, after the course, the highest stage of concern for the pre-service teachers is Stage 0 (awareness). However, as stated by Hall, George, and Rutherford (1977), only a high Stage 0 score is not sufficient to make interpretation. In such a case, other stage of score (Stage 1 and Stage 2) can be used. Nonusers of the innovation are high on the Stage 0 as well as Stages 1 and 2. Therefore, the pre-service teachers who were high on Stage 0 with high on Stage 1 and 2 regarded as non-user of the educational computer games, meaning awareness of and concern about the educational computer games.

Table 3: Frequency of Highest Concern Stages for 31 Last-year Pre-service Teachers' Concerns about Educational Computer Games as measured by the Stages of Concern Questionnaire

Stage		0	1	2	3	4	5	6
		Awareness	Informational	Personal	Management	Consequence	Collaboration	Refocusing
Number of Individuals	Pre-test	8	12	5	1	0	2	3
	Post-test	20	5	3	0	0	1	2

3.2. First and Second High Stage Score Interpretation

In order to get more detailed interpretation, both the high stage score and the second highest stage score were examined. For this analysis, the pre-service teachers' highest stages of concern with their second highest stage for pre and post tests were arranged into rows and columns (see Table4). Table 4 indicates that before taking the course, the pre-service teachers who were highest on Stage 1

(informational) were second highest Stage 2 (personal), accounting for 25,81% of them, whereas after completing the course, those who were highest on Stage 0 (awareness) were second highest Stage 1 (informational), accounting for 32,26% of them. Consequently, before the course, the pre-service teachers concerns about what educational computer games were and what the use of educational computer games entails, as well as personal concerns for educational computer games and their consequences. On the other hand, after completing the course, the pre-service teachers had awareness of and concern about the educational computer games as well as requested further information about them.

Table 4: Percentage of Second Highest Stages of Concern in Relation to First Highest Stages of Concern

Highest Stage of Concern	Awareness	Informational	Personal	Management	Concequence	Collaboration	Refocusing	Row Total Percent	Row Total	Awareness	Informational	Personal	Management	Concequence	Collaboration	Refocusing	Row Total Percent	Row Total
	0	1	2	3	4	5	6		N	0	1	2	3	4	5	6		N
0 Awareness	0	3,23	12,90	9,68	0	0	0	25,81	8	0	32,26	19,35	9,68	0	0	3,23	64,52	20
1 Informational	6,45	0	25,81	0	0	0	6,45	38,71	12	0	0	12,90	0	0	0	3,23	16,13	5
2 Personal	6,45	0	0	3,23	0	0	6,45	16,13	5	3,23	6,45	0	0	0	0	0	9,68	3
3 Management	0	3,23	0	0	0	0	0	3,23	1	0	0	0	0	0	0	0	0	0
4 Concequences	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Collaboration	0	0	3,23	0	0	0	3,23	6,45	2	0	0	0	0	0	0	3,23	3,23	1
6 Refocusing	3,23	3,23	0	0	0	3,23	0	9,68	3	0	0	0	0	3,23	3,23	0	6,45	2
Total								100,00	31								100,00	31

3.3. Group Profile Interpretation

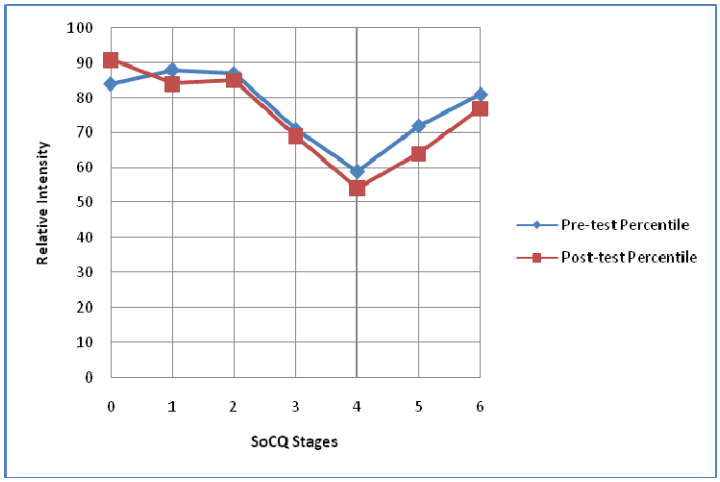
The more sensitive interpretation of the sage of concern of the pre-service teachers was obtained from profile interpretation. For this interpretation, tabular listing of group percentiles (Table5) and the plots of these percentile score on a graph (Graph 1) were generated. According to them, before the course on educational computer game the pre-service teachers were aware of and concerned about educational computer games (Stage 0) and were interested in learning more about the educational computer game from a positive perspective (Stage 1 slightly higher than Stage 2). Moreover, they were not concerned about managing the use of educational computer games (low Stage 3) and about the educational computer games' consequences for the classroom.. In addition, they were not much concerned about the cooperation with others for the use of educational computer games. However, tailing-up Stage 6 indicates the pre-service teachers have some resistance to the use of educational computer games.

On the other hand, after completing the course, the pre-service teachers' personal concerns overridden their informational concerns because the Stage 2 concern is near to the Stage 1 concern. In other words, the pre-service teachers were more concerned about their own role in relation to the use of educational computer games than learning about the nature of educational computer games. As Hall, George, and Rutherford (1977) pointed out, discussions about educational computer games with pre-service teachers with this profile intensify the high Stage 2 concerns and reduces the Stage 1 concern. Also, tailing-up Stage 6 indicates the pre-service teachers show some resistance to the use of educational computer games.

Table 5: Pre-test/Post-test Group Percentiles as Measured by the Stages of Concern Questionnaire

Stage	0	1	2	3	4	5	6
	Awareness	Informational	Personal	Management	Consequence	Collaboration	Refocusing
Pre-test Percentile	84	88	87	71	59	72	81
Post-test Percentile	91	84	85	69	54	64	77

Graph 1. Pretest/posttest Stages of Concern Comparison Composite Profile for 34 Last-year Pre-service Teachers' Concerns about Educational Computer Games as measured by the Stages of Concern Questionnaire



5. DISCUSSION

Both peak stage score and first and second high stage score interpretation of the pre-service teachers' concern about the use of educational computer game revealed that the course on the game-like learning environment contributed to pre-service teachers' awareness of and concerns about the educational computer games. While before the course pre-service teachers had personal concerns about what educational computer games was, after completing the course they became more aware and concerned about educational computer games and so demanded further information about the use of educational computer games.

In parallel with these findings, further information and practice on the game-like learning environment could increase preservice teachers' motivation in educational games and more consequently they would adopt the educational computer games in their profession. Extra practice can be provided to pre-service teachers through a follow up course, more resources, and materials. Furthermore, preservice teachers alsi need to focus on the implementation of the game-like learning environment in the classroom. This is because group profile interpretation pointed that after pre-service teachers had enough information about educational computer games, they began to concern about their own role in relation to the use of educational computer games.

This study pointed the need for the future research on pre-service teachers' resistance on the use of educational computer games in the classroom since pre-service teachers have some resistance to the use of educational computer games before and after taking a course on game-like learning environment, which is revealed in the group profile interpretation.

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