



Computer Games as Programming Education Tools

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Abstract

Nowadays, a lot of basic systems from traffic lights to navigation devices run by using codes of a programming language. Computer programing is an important process consisting verbal and numeral skills together. During the education of this process, learners need to overcome some difficulties related to the algorithms, codes or compilers. The purpose of this study is to suggest a new approach for overcoming the difficulties or barriers to programming education process by using the facilitative and entertaining characteristics of computer games. In the study, students have programmed their own games as programming education project, namely computer games have been used in "Game to Learn" characteristic. At the end of the study, learners' thoughts about the barriers that they experienced during the programing language education and developing computer game as project were investigated. Results showed that developing computer game as programming education project motivate the learners to overcome the barriers. Results obtained from the study presented by percentage frequency tables and interpreted by researcher. Recommendations were given for further investigations into more effective strategy in the teaching of programming languages.

1. Introduction

Nowadays, computer games are entertainment software used by a lot of individuals regardless of age, culture or country. In urban societies, playing with computer games, joining to digital game groups or connecting to social networks with embedded games are ordinary activities of daily life [1]. Games, with their emphasis on fun and pleasure, and their often repetitive challenges, have until recently been seen as a distraction from the more serious business of computer aided learning [6]. Enhancing individual tendencies to the computer games in social life bring the academic studies related to computer games and gaming activities ([2];[3];[4];[5];[6]).

When these studies are analyzed, it is seen that entertainment in various computer games can be used as a supportive factor for reaching to different educational goals. Because, while a user playing computer game should cope with different short term problems, long term strategies or complex and related to each other "missions", along with the entertaining process of the game [7]. This complex cognitive process of playing computer games emerges some different usage areas, like learning environments.

Digital game supported or digital game based learning environments provide useful effects to learning process [1]. Digital game based learning approach is both more effective in promoting students' knowledge of computer memory concepts and more motivational for students than the non-gaming approach [8]. Computer games used in classrooms enhance academic success and attention to the course of the students [9], [10]. Education theories recognize the value of incorporating alternative activities (games, exercises and simulations) to stimulate student interest in the educational environment, enhance transfer of knowledge and improve learned retention with meaningful repetition [11]. Different computer game characteristics can be related with different educational targets and theoretical targets.

An educational taxonomy of games has been presented in Table1 to determine the concepts and educational relationships among the computer games and educational theories [12].

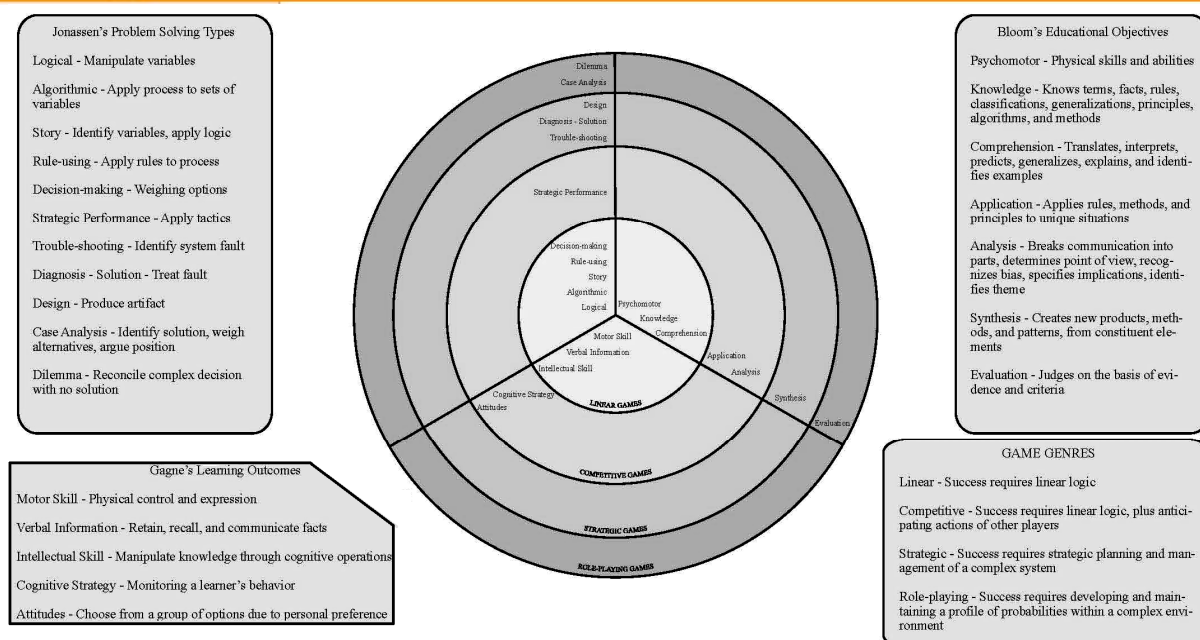


Figure 1. Educational taxonomy of computer games [12]

Given the educational potentials of computer games seen on Table 1, there is no doubt about the cognitive benefits of using a game along with a learning process. However, not only playing games but also making them can provide cognitive benefits to these process. Far less prominent has been any research on the instructionist counterpart—making games for learning. We know that as many children enjoy playing games according to given rules, they are also constantly modifying rules and inventing their own games [13]. Designing a complex piece of software such as a computer game is an effective way of learning the programming language. Computer programming involves a high degree of problem-solving activity and is perceived as an essential skill for today's digital world [14]. Programming their own games allow students to construct their own ideas and be able to master complex programming concepts to create sophisticated products, students think about and deal with problems in their games through invented stories or fantasies—contexts that are rarely promoted in textbooks or worksheets [15]. This important role of the computer games emerges a new approach in terms of using these tools in learning environments. In this context, effects of using computer games as targeting tools during a programming learning course project were investigated In this study.

2. Method

Descriptive(survey) method was used in the study. The study group of the research included 40 second grade students taking the course of Programming language II for the first time which was given in the Department of Computer and Instructional Technologies in the Education Faculty of Yıldız Technical University in fall term of the academic year 2009-2010. The course was taught on applied basis in five class hours a week. During the course, students, having taken C# programming language education for fourteen weeks, were wanted to develop an educational computer game as project of the lesson. The reason that they were wanted to develop an educational content especially is due to the instructional characteristics of the department. At the end of the study, computer games were developed by the students were reviewed, students' opinions related to the process were taken and evaluated through a survey prepared by researcher.

3. Findings

In this section, findings obtained from the survey are presented. "Yes-No" Questions were used for obtaining data. These questions revealed very conclusive findings about the characteristics of participants related to usage of programming languages and opinions of the students about the project



of developing computer game. The questions were answered by 40 students having attended the programming language course and responses were summarized in frequency-percentage Tables.

Firstly, programming preferences of the participants were investigated of the participants and answers to questions were summarized on table 1.

Table 1 Programming preferences of the participants

Question	Yes		No	
	f	%	f	%
<i>Before the university education I am not interested in programming</i>	20	50%	20	50%
<i>I don't like programming language courses</i>	12	30%	28	70%
<i>I like doing programming activities in my free times</i>	25	63%	15	37%
<i>I want to develop graphical software</i>	23	58%	17	42%
<i>I want to develop database applications</i>	25	63%	15	37%

As seen on table 1, half of the participants (50 %) are not interested in programming before the university education but much of them like programming language courses (70 %). Additionally, students like developing software in their free times (63 %) and want to develop both graphical (58%) and database supported(63%) applications. In the survey, secondly, opinions of the students about the project of developing computer game were questioned and responses were presented on table 2.

Table 2 Opinions of the students about the project of developing computer game

Question	Yes		No	
	f	%	f	%
<i>It is an enjoyable process to develop a computer game</i>	26	65%	14	35%
<i>It is very difficult for me to embed educational content to the game</i>	27	68%	13	32%
<i>While developing my game I need to learn new code blocks</i>	34	85%	6	15%
<i>The topic of developing computer game enhanced my willingness to make this project</i>	25	63%	15	37%
<i>I believe that it will be entertaining to play with my game</i>	22	55%	18	45%
<i>If there wasn't any educational content I would develop the game easier</i>	28	70%	12	30%
<i>If I used another programming language I would develop the game easier</i>	22	55%	18	45%
<i>I tried to develop an entertaining game</i>	30	75%	10	25%
<i>I developed a multiplayer game</i>	7	18%	33	82%
<i>I developed a database supported game</i>	22	55%	18	45%
<i>In the future, I want to develop new computer games</i>	20	50%	20	50%

As shown in Table 2, participants generally (65 %) believe that it is an enjoyable process to develop a computer game but preparing the educational content of the game is difficult process for them (68%). students state that they need to learn new programming codes while developing computer game(85%) and the topic of developing computer game was enhanced their *willingness to make this project* (63%) are important findings of the study. Entertainment is an important characteristic for an computer game, most of the participants (75%) stated that they wanted to develop an entertaining computer game and much of them (55%) believe that games developed by them are entertaining games. For to investigate the constraint of the programming language (C#) whether they could develop their game easier if the used another programming language was questioned and much of the participants (55%) answered "yes" to this question. As finally, half of the students (50%) stated that they wanted to develop new computer games in the future. The obtained findings of the study were commented on the conclusion section.

3. Conclusion

Programming language education is a complex and difficult process including different cognitive activities like problem solving, exploring, analyzing the concepts and creativity. During this process, supporting learners by educational tools is important for the efficiency of educational outputs. These supportive tools can be targets as well as physical tools. In this study, it was seen that a programming

language education process targeting a computer game development project can affect the opinions of the students positively. Opinions of the students show that coding a computer game can enhance the willingness of learners to make programming projects. However, educational content of the games having developed by the students was a restrictive factor for them, therefore, it can be said that a flexible concept determined at the beginning of the process will prevent emerging this restriction against developing computer game. Most of the students stated that they had tried to develop an entertaining computer game, and during the process they need to expand their knowledge of programming, this finding of the study is parallel with Kafai's (2001) statements that programming their own games allow students to construct their own ideas and be able to master complex programming concepts to create sophisticated products [8]. This study is an descriptive study made to determine the awareness of using computer games as products of programming language courses. We hope that experimental studies will be made related to using computer games as target of programming language course projects will provide to reach more conclusive findings.

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