

DIGITAL GAME-BASED LANGUAGE LEARNING IN FOREIGN LANGUAGE TEACHER EDUCATION

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ABSTRACT

New technologies including digital game-based language learning have increasingly received attention. However, their implementation is far from expected and desired levels due to technical, instructional, financial and sociological barriers. Previous studies suggest that there is a strong need to establish courses in order to support adaptation of game-based learning pedagogy through helping teachers experience digital games themselves before they are expected to use them in teaching. This study was conducted to investigate educational digital games in foreign language teaching, to identify the determining reasons behind the pitfalls in applications and to explore the contribution of a serious game to the development of professional language skills of pre-service teachers. Pre- and post-tests were applied to measure the contribution of the game to the development of their language skills. In addition, a game diary and semi-structured interviews were used to elicit information about the problems pre-service teachers had and their perceptions on the whole process. The analysis of the data illustrated that there was great improvement in pre-service teachers' professional language skills and attitudes towards using these games while teaching in the future. This is important in foreign language teacher education in terms of enhancing digital game-based language learning pedagogy for teachers.

Keywords: Digital game-based language learning, DGBLL, serious games, foreign language teacher education, German learning.

INTRODUCTION

The advent of new mobile technologies over the last decade has considerably changed the experience of learning processes in foreign language education. One such new technology implemented in language teaching contexts is Digital Game-Based Language Learning (DGBLL). Digital games are considered as primary components within the field of Computer Assisted Language Learning (CALL) (Cornille et al., 2012; Reinhardt et. al, 2014), just like the traditional games are regarded as part of Second Language Acquisition (SLA) (Wright et al., 1984; Ersoz, 2000). CALL software packages have so far provided small digital games such as hangman, puzzle and sentence production device to teach vocabulary and grammar in addition to various materials and activities to develop language skills (see Tell Me More, Einblicke Multimedia Language Trainer, etc.). Furthermore, web and mobile versions of these kinds of stand-alone games are developed and some of them are integrated into foreign language learning process. (Browne & Culligan, 2008; Kocaman & Kizilkaya Cumaoglu, 2014b). There are 108 German language learning applications offered by Appstores. The majority of the applications are for young learners' vocabulary and grammar progress, and only 17 of them are games. However, this kind of mobile or web games are not as comprehensive as commercial off-the shelf (COTS) adventure-entertainment games widely played by the youth in terms of form, technical and linguistic content. Regarding the

fact that COTS are widely played, games are developed on the basis of mechanics, structure and content of COTS games in the last decade. Thus, digital games in DGBLL literature are divided into two main categories: COTS adventure-entertainment games (e.g. World of Warcraft) and educational games, also called serious games (SG) or edutainment (e.g. Mingoville, The English Minnits, Language Trap, The Mystery of the Sky Disc, A Mysterious Mission) (Prensky, 2001; Gerhardt, 2008; Squire & Klopfer, 2008; Thorne et al., 2009). Then, they are divided into subcategories such as Simulations (e.g. Digibahn, Mingoville), Synthetich immersive Environments (e.g. Croquelandia, EVEIL-3D) and role play games (RPG) (e.g. The English Minnits, A Mysterious Mission etc.).

DGBLL literature shows that previous studies have been conducted mostly on COTS adventure games. Studies on learning a foreign language through COTS games investigated the effects of player attributes, in-game and non-game variables and reported mainly positive results (Cornille et al. 2012; Peterson, 2012; Turgut & İrgin, 2010). However, the studies focusing on serious games just offered technical and instructional suggestions (Breuer, 2010; Cai et al., 2013) and examined mostly learners' opinions towards SGs. All the previous studies, except one (De Grove et al., 2011), reported that students had positive attitudes towards SGs and that their motivation was a determining factor in their positive perceptions of the games (Doe, 2014; Jantke & Hume, 2015; Howland et al. 2013; Romero & Barma, 2015). The factors affecting learners' success in SGs included player attributes (i.e. age, gender, game literacy, attitudes and playing frequency), in-game elements (i.e. games narrative structure, multimedia, interaction) and non-game variables (i.e. motivation, autonomy, immersion, social interaction). SGs and CALL software contributed to learners' vocabulary knowledge (Muller, 2012; Peirce & Vade, 2010) and SGs led to more positive attitudes and higher motivation than CALL software (Kocaman & Kizilkaya-Cumaoglu, 2014b). The positive impact and instructional advantages of DGBLL materials over printed course materials have been reported in relation to improvements in learners' listening skills (Bernert-Rehaber & Schlemminger, 2013; Levy & O'Brien, 2006; Roy & Schleminger, 2014), in vocabulary knowledge (Kocaman and Kizilkaya-Cumaoglu, 2014b) and writing skills (Levy & O'Brien, 2006; Neville et al., 2009) in communication, grammatical accuracy and writing skills (Berns et al. , 2013) and in learners' general fluency, pronunciation and reading skills in the target language (Levy & O'Brien, 2006). Along with language skills, positive results have also been reported in raising learners' intercultural awareness and intercultural communicative competence (Guillén-Nieto & Aleson-Carbonell, 2012; Levy & O'Brien, 2006) because serious games provided learners an invaluable opportunity to truly experience the target culture.

On the other hand, teachers' aspects are the least explored issue in these types of studies. In addition, the studies conducted so far on teachers' attitudes towards DGBLL have not consistently produced positive results. Indeed, the findings of the previous research are quite contradicting since positive, unsure and negative attitudes have been reported in various studies. However, the widely-held view is that teachers do not always have positive attitudes and they are not as enthusiastic as the learners in using digital games in classrooms due to the generational divide. Even in cases where teachers' positive attitudes were reported, it has been shown that they have low digital game literacy and DGBLL pedagogy (Chandler, 2013; Karadag, 2015; Millstone, 2012; Yilmaz Ince & Demirbilek, 2013), which was observed especially with elder generation teachers (Blamire, 2010; Breuer, 2010; Sandford et al., 2006). In cases where teachers were unsure in using digital games, it was clear that they were actually interested in integrating these games but worried about the classroom implementation due to various pedagogical and technical constraints. Findings of the previous research suggest that there is a strong need to establish teacher training courses in order to support adaptation of game-based learning pedagogy through helping teachers experience the digital games themselves before they are expected to use them in teaching.

DGBLL has received increased attention especially in recent decades since successful implementations have been reported in various studies. However, its implementation is far

from expected and desired levels due to technical, instructional, financial and sociological barriers. Teachers and parents may have negative opinions as these games are considered to cause addiction, loss of time and violence (Demirtas Zorbaz et al., 2014; Allsop et al., 2013; Breuer, 2010). Moreover, the number of studies focusing on languages other than English, or investigating the use of serious games with longer scripts and implementations of DGBLL with pre-service foreign language teachers are very limited. As stated by Backlund and Hendrix (2013), no longitudinal empirical study has been conducted so far. The purpose of this study as a part of a larger project is to investigate the contributions of serious games with long scripts to the development of professional language skills of pre-service German teachers. In other words, the study aims to analyze the status of utilizing m-learning applications and educational digital games in foreign language teaching, to identify the determining reasons behind the pitfalls in applications and to explore ways of contributing to the linguistic and professional development of pre-service teachers. The study has two major parts: to identify pre-service teachers' position in utilizing Mobile Assisted Language Learning (MALL) and DGBLL, and to examine the contribution of a serious game to the development of vocabulary, language skills and professional development of pre-service teachers.

This paper reports the first phase of a longitudinal study and explores possible ways for contributing to the development of linguistic and professional skills of pre-service teachers through serious games with long scripts. The study in which the participants can be viewed as both learners and future teachers sought answers to the following research questions:

- 1) What are the pre-service teachers' beliefs about the integration of digital games into lessons and about the effects of these games on the linguistic and professional development?
- 2) Does the serious game 'A Mysterious Mission' help pre-service teachers acquire professional terminology?
- 3) Does learning success vary depending on foreign language learning strategies, especially compensatory strategies used by pre-service teachers?
- 4) Do the participants' age, gender, game preferences and language priming affect their success in learning?
- 5) Are "games multimedia features" as an in-game variable and "motivation" as a non-game variable involved in the learning process?
- 6) Does the work with "A Mysterious Mission" contribute to the participants' teacher qualifications in the context of DGBLL?

METHOD

The study used embedded mixed research design (McKay, 2006; Yildirim & Simsek, 2013). The major database for the study were the quantitative data obtained through vocabulary knowledge test and the responses regarding the contribution of digital games to the professional development of pre-service teachers. Qualitative data were collected to support the quantitative data mentioned above.

Participants

The sample group for the study consisted of 60 second-year pre-service teachers (53 females and 7 males) attending the department of German language teaching at a state university in Turkey in 2014-2015 Spring Semester. All second-year pre-service teachers taking educational technologies and materials design course was chosen as the sample group. The age pattern of the participants ranged between 19 and 35, the average age was 22.33. Information about the participants' owned mobile devices and their intended use was gathered and reported in Table 1 below.

Table: 1
Owned Devices and Extramural MALL Activities of the Participants

	N	%
Owned devices and Internet Connection	Smartphone	60
	Tablet	25
	PC	14
	Game Console	13
	Internet Connection(ADSL & Mobile)	47
	Internet Connection (Only Mobile)	13
Type of using mobile devices for extramural language learning purposes		
Dictionary	48	80
Listening (Radio broadcastings, music, etc)	26	43.3
Watching movies (TV channels, Videocastings)	17	28.3
Vocabulary learning	17	28.3
Reading (Newspapers, instructional material)	16	26.7
Grammar	9	15
Pronunciation	6	10
Interactive exercises (for different skills)	6	10
Translation	3	5

As the data analyzed illustrate, 76.7 % of the participants (n=46) indicated that they played games with their mobile devices for four hours a week on average; and 39.13 % of those playing with mobile devices (n=18) stated that they played massively multiplayer online role play games (MMORPG), simulation/virtual world or other types of entertainment/adventure games having long text instructions (walkthroughs or in game instructions/quests). Half of the participants (52.17 %; n=24) played small games without or with short text instructions, and 8.7 % (n=4) played games for learning language such as word games. Majority of the participants (86.7 %; n=52) wanted to play the serious game integrated into the Educational Technology and Material Design course, and 13.3 % (n=8) stated that they were not sure about it.

Instructional Materials

The serious game Adventure German-A Mysterious Mission (2013) - developed by Goethe Institute as a type of role play game (RPG) was chosen. Thus, the cost and copyright problem which prevent DGBLL was resolved. The game has a long script and 18 different characters, two of them are the main characters. The setting of the game was located in 7 different indoor and outdoor places (Figure 1) in 12 episodes and the game was based on a detective story in which a person was kidnapped for a secret project and rescued.

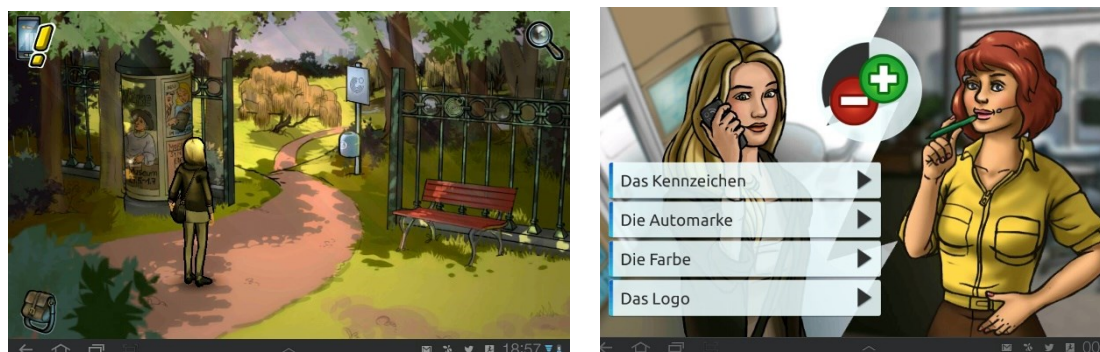


Figure: 1
Two screenshots showing game's indoor and outdoor places

The game can be implemented in classroom context as a language teaching material and has rich language content with the elements of game tutorials, characters' introductions, game story, audio dialogs, and reading texts, personal and business letters/e-mails and consists of 70 pages in total (16.572 words, 2.407 single items). The scenario of the game is written in standard German variety. Instructional materials for the game was designed in cooperation with the game's developer team from Goethe Institute, who provided valuable support in analyzing linguistic features and preparing achievement tests and extra exercises for the game text before the project was started.

Data Collection Instruments

In the study, an information form was used to identify the pre-service teachers' demographical data, their personal digital belongings and their purpose of using them, whether they play digital games, their preferences and their views on the contributions of digital games to language learning. Also, a vocabulary knowledge test and a vocabulary learning strategies scale were used. Furthermore; the participants also kept a diary to note down the words, grammatical structures and cultural elements. At the end of the process (i.e. eight weeks), pre-service teachers' experiences were assessed via semi-structured interviews.

Information Form

The information form to gather the participants' individual characteristics has been developed by the researchers. It contains 24 items to identify the kind of digital belongings they have, their general or language learning purposes of using them (MALL), whether they play digital games, their game preferences, what kind of games they play, how they play (on their own, with their friends, with their parents), language preferences, how much time they spend playing games, the effects of the games on their language progress and their views on integrating games into classrooms.

Vocabulary Learning Strategies Scale

A vocabulary learning strategies scale which was developed and tested for reliability and validity by Kocaman and Kizilkaya Cumaoglu (2014a) was used. The scale is the only language learning strategy scale that contains technological items for compensatory strategies. It consists of 32 items at 5-point Likert scale and the participants responded the items by giving 1-5 points (1=never; 5=always). In the present study, only the findings for the compensatory strategies gathered were compared to the participants' success.

Achievement Tests

The researchers formulated a list by choosing 620 words from the game text (357 nouns, 208 verbs and 55 adjectives) to identify the progress of the pre-service teachers' professional vocabulary size. The actual game 'A Mysterious Mission' consists of 2407 single word repetition and in total 16.572 words at B1-B2 level and the content of the game is in professional German. Therefore, daily language words were eliminated and only the professional words about job search, job application, interview and presentation were selected. All the words, except some new words and Anglicisms (e.g. das Management), appear in Profile Deutsch Register. This means students at B1-B2 levels are supposed to know these words as specified by the CEF. Vocabulary Knowledge Test was applied via pre- and post-test and the participants were expected to write the equivalence of the words in Turkish. The test was provided to the participants as a digital text document before and after the serious game activity through LMS platform and expected to complete the task during the classroom hour. 1 point was given to the participants for each correct answer.

Game Diary

The pre-service teachers were expected to submit their game diaries comprised of seven items through the Learning Management System of the university. These subcategories are the hardware they used to play games, daily/weekly time periods that they spent, words that they learned during the games (equivalents in Turkish and the sentences including the words), new grammatical structures, new information about the target culture and world knowledge, activities that they had to resolve while playing the game, some properties of

the game such as motivating/amusing /boring parts and difficulties they experienced, whether they preferred using games for their future classes at the end of the period. The first version of the game diary form consisted of nine items. This original form was sent to two experts for revision. Two items were excluded by the experts because they were related to pre-service teachers' personal development, not to their language development.

In-Class Interviews

The participants were assessed via semi-structured interviews which were based on the notes in their game diaries. They were interviewed on their overall evaluation of the game; whether they found the game efficient or not, whether they thought they progressed in a skill other than the vocabulary size in the target language. The interviews were conducted for a total of 90 minutes at the end of the eighth week on the following seven subcategories by the researcher. These are "the time spent for the game, problems encountered, new word/grammatical structures numbers in the game diaries, in-game exercises, and language level of the game content, evaluation of the game in terms of technical features including difficulty, attractiveness, visual design and soundtrack. They were also asked whether they thought using digital games in their teaching in the future.

Analysis of Data

In order to test the quantitative data for the relevant research questions, the data were analyzed using the software package SPSS 21.0 through two-way ANOVA, multiple comparison tests (Scheffe), t-test Mann-Whitney U test and descriptive statistics for related samples were used. The qualitative data obtained through interviews and game diaries was analyzed using content analysis (McKay, 2006), and the findings were reported through descriptive/qualitative analysis.

Implementation Process

The implementation of games were integrated into Education Technology and Materials Design course in 2014-2015 Spring semester and applied for eight weeks. This course was preferred since the content of the lesson was appropriate to integrate the digital games. The whole content of the lesson (YÖK, 1998: 27; 2007:158) was carried out successfully as it aims to analyse, use and develop the digital material designs (text, audio, video, presentation etc.) and digital games as course content. Digital games were applied out of class hours and the evaluation of the process (experiences, difficulties that they encounter during the games, etc.) was done in the last 15 minutes of the class hours and through Learning Management System (LMS). Furthermore, a social network webpage (Auftrag, 2015) was created in order for the participants to share their experiences like achieving the game goals, consulting others when they fail.

RESULTS

Before the analysis, the data were checked for outliers and missing data. No outliers were observed in the data. Missing data in the set were replaced by the mean score (3) before subsequent analysis. The data illustrated normal distribution except for the mean values of pre-test and post-test scores of gender. Since the data were not normally distributed in the case of gender effect on success, Mann-Whitney U test was conducted. The internal consistency of the 32-item vocabulary learning strategies scale calculated by using Cronbach's alpha coefficient. The values obtained were .853.

In order to identify the beliefs of the pre-service teachers about DGBLL, they were asked if they found the digital games (both COTS and SG) useful for learning a foreign language. Most of them (86.7 %; n=52) responded "Yes" and 13.3 % (n=8) stated they were not sure about it. In open-ended questions section, they were asked which linguistic skills they believed digital games would help to improve. Table 2 shows the participants' beliefs about the effects of digital games on developing linguistic skills.

Table: 2
Participants Beliefs on Contribution of the Digital Games Developing the Linguistic Skills

	N	%
Vocabulary	20	33.3
Reading	18	30.0
Listening	17	28.3
Speaking, Fluency, Pronunciation	3	21.7
Grammar	7	11.7
Writing	3	5.0
Other (idioms, etc.)	1	1.7
Information about target culture	2	3.3

The second research question of this study examined using the vocabulary achievement test whether the game "A Mysterious Mission" contributed to the development of pre-service teachers' professional terminology. For this purpose, a paired-samples t-test was conducted to evaluate whether there was a statistically significant difference between the mean values of pre-test and post-test scores for vocabulary.

Table: 3
Post- and Pre-test Results for Vocabulary Achievement

Measurement	N	M	SD	df	t	p
Post-Test	60	40.60	7.43	59	18.41	.000
Pre-Test	60	35.19	6.15			

The results indicated that the mean value of post-tests scores (M=40.60; SD=7.43) was significantly greater than the mean value of pre-test scores for vocabulary (M=35.19; SD=6.15; $t(59)=18.41, p<0.01$).

In order to test the third research question, one way analysis of variance (ANOVA) was conducted using vocabulary learning strategies scale to evaluate the effect of the compensation strategy use on the pre-test scores of participants since the Levene Test has indicated that the variances of scores across the different frequency groups are homogeneous ($L=1.20, p=0.31$).

Table: 4
Comparison among Pre-test Scores of Groups Depending on the Use of Compensation Strategies

Variance	Sum of Squares	df	Mean Square	F	p
Between Groups	91.94	2	45.97	1.22	.30
Within Groups	2141.95	57	37.58		
Total	2233.90	59			

Test results of ANOVA indicated that there was no significant difference among the mean scores using the vocabulary achievement test of pre-test results of participants depending on the use of compensation strategies in different frequencies ($F(2-57)=1.22, p>0.05$). One way analysis of variance was conducted to evaluate the effect of the compensation strategy use on the post-test scores of participants since the Levene Test has indicated that the variances of scores across the different frequency groups are homogeneous ($L=0.80, p=0.45$).

Table: 5
Comparison among Post-test Scores of Groups Depending on the Use of Compensation Strategies

Variance	Sum of Squares	df	Mean Square	F	p
Between Groups	88.17	2	44.08	.79	.46
Within Groups	3168.26	57	55.58		
Total	3256.43	59			

Test results of ANOVA indicated that there was no significant difference among the mean scores of post-test results of participants depending on the use of the compensation strategies ($F(2-57)=0.79$, $p>0.05$).

For the fourth research question of this study, one way analysis of variance was conducted to evaluate compare the participants' age and their pre- and post-test scores.

Table: 6
ANOVA Table for Pre-Test Results for Measurement of Age Groups

Variance	Sum of Squares	df	Mean Square	F	p	Significant Difference
Between Groups	384.29	2	192.15	5.92	.005	(19-21)-(22-24)
Within Groups	1849.60	57	32.45			(19-21)-(25+)
Total	2233.90	59				

Test results of ANOVA indicated that there was significant difference among the mean scores of pre-test results of participants from three age groups ($F(2-57)=5.92$, $p<0.05$). To see the mean differences among age groups Scheffe Test was conducted and the test results revealed that mean score of 28 participants from 19-21 age group ($M_{(19-21)}=32.49$) is statistically lower than the mean scores of 26 participants from 22-24 age group ($M_{(22-24)}=37.48$) and the mean score of 6 participants from 25+ age group ($M_{(25+)}=37.90$), ($p=0.009$).

One way analysis of variance was conducted to evaluate compare the age of participants and their post-test scores.

Table: 7
ANOVA Table for Post-Test Results for Measurement of Age Groups

Variance	Sum of Squares	df	Mean Square	F	p	Significant Difference
Between Groups	603.55	2	301.77	6.48	.003	(19-21)-(22-24) (19-21)-(25+)
Within Groups	2652.88	57	46.54			
Total	3256.43	59				

Test results of ANOVA indicated that there was significant difference among the mean scores of post-test results of participants from three age groups ($F(2-57)=6.48$, $p<0.05$). To see the mean differences among age groups in pre-test Scheffe Test was conducted and the results revealed that mean score of participants from 19-21 age group ($M_{(19-21)}=37.23$) is statistically lower than the mean scores of participants from 22-24 age group ($M_{(22-24)}=43.36$) and the mean score of participants from 25+ age group ($M_{(25+)}=44.41$), ($p=0.007$).

The effects of the participants' gender on the mean average of their success were examined. Since there is a great difference between the populations of groups and the data sets were not distributed normally, instead of an independent-samples t-test, a Mann-Whitney U test was conducted to evaluate whether there was statistically significant difference between the mean values of pre-test and post-test scores of genders. The results of the test indicated that the difference between pre-test scores ($U=112.5$, $z=1.68$, $p>0.05$) and post-test scores ($U=116$, $z=1.60$, $p>0.05$) of female and male participants was not statistically significant.

The study also investigated whether the participants' being a gamer or a non-gamer (that is, whether they play digital games or not; and how much time they spent playing games every week) had an effect on the success of the process. An independent-samples t-test was conducted to evaluate whether there is significant difference between the mean values of pre-test and post-test scores of 46 participants who play digital games ($M_{PreTest}=34.91$ and $M_{PostTest}=40.35$) and 14 participants who do not play digital games ($M_{PreTest}=36.13$ and $M_{Post-Test}=41.33$). The results indicated that the difference between pre-test scores ($t(58)=-0.43$, $p>0.05$) and post-test scores ($t(58)=-0.37$, $p>0.05$) of the participants is not statistically significant. One way analysis of variance was conducted to evaluate the effect of the time spent for playing digital games on the pre-test and post-test scores of participants. Test results of ANOVA indicated that there was no significant difference among the mean scores of pre-test ($F(3-56)=0.37$, $p>0.05$) and post-test results ($F(3-56)=0.54$, $p>0.05$) in terms of time the participants spent playing the games.

The language that the participants preferred while playing the game was examined in terms of its effects on their success in the game. An independent-samples t-test was conducted to evaluate whether there was statistically significant difference between the mean values of pre-test scores of 28 participants who preferred game instructions in German ($M_{PreTest}=36.30$ and $M_{PostTest}=42.35$) and 32 participants who preferred English ($M_{PreTest}=36.13$ and $M_{PostTest}=39.08$). The results indicated that there was no significant difference between pre-test scores ($t(58)=1.43$, $p>0.05$) and post-test scores ($t(58)=1.73$, $p>0.05$) of the language priming groups.

The fifth and the sixth research questions of the study asked whether the in-game and non-game variables such as multimedia features and motivation were involved in learning process and whether the serious games contributed to the participants' teacher qualifications in the context of DGBLL. The answers to these questions were obtained in the data gathered through game diary and in-class interviews.

Although 'A Mysterious Mission' game can be played with tablet computers and smart phones, only two of the participants in their diaries stated that they played the game with the tablet computers and the rest of the students played it with their personal mobile phones but all of the students took notes via using a PC/laptop. It was concluded from the diaries that game was played between 4-23 hours. Students noted 5-30 words to the 'newly learned vocabulary' part but they didn't write anything to the 'newly learned structure' part. Only one of the students noted 30 words and one student noted 5 words. The others noted between 12-23 words. Although a considerable number of participants (72 %; $n=43$) stated that during the games they used the online dictionary frequently via a laptop or PC as suggested, 28 % of them ($n=17$) stated that they sometimes used online dictionaries for some parts of the games. Nothing was stated about the difficulties to be resolved during the game. The participants noted down about 2 to 5 newly learned elements comparing Irish and German cultures, (as German people prefer directly speaking strategy instead of indirect strategies, and their salutation style, punctuality being important for German, whilst it is less important for other cultures, rules about the parks (dos and don'ts)) cultural elements from world knowledge, business world, Hollywood (e.g. The Devil Wears Prada), Walt Disney (e.g. Bugs Bunny) and Western films (e.g. The Good, the Bad and the Ugly) were also noted. For the encouraging/amusing parts of the game, participants marked the properties from 1 to 4. (e.g. game's graphics, clothing game, main character, jokes). Furthermore 6 of the participants stated the 3D graphics of the game were very realistic.

Majority of the participants (n=47) indicated that two parts of the game (4th and 11th) are particularly more boring as the texts and dialogs were longer than the other parts. That is the reason for the participants why these two parts are more exhaustive and boring than the other parts. For the part of the difficulties they encountered, 12 of the participants stated technical difficulties, 17 of them stated game challenge, 21 of them stated handling language tasks. 10 out of 12 participants who declared that they had technical problems while downloading or playing the game noted down that they consulted their more experienced friends. The other two students who played the game via their tablets because their mobile phones were not compatible with the game's minimum requirements stated that they had no problems. For the question whether they use these kinds of serious games as a course material in their future classes, 86.7 % of the participants responded "Yes" (n=52), and only 13.3 % of them responded as 'Not Sure' (n=8).

The process was evaluated through semi-structured in-class interviews, the researchers' observation and the data from the participants' diaries. They shared their experiences and views in seven subcategories at the end of the eighth week.

The qualitative data gathered through in-class interviews were analyzed using textual and discourse analysis, which require a close and systematic reading of the responses given by the participants in order to reach a theory (Corbin & Strauss, 1990; Strauss & Corbin, 1998). The findings obtained through the interview were noted on the interview sheet and labeled using emergent coding method after the content analysis. Since it was not possible to predict the time students might spend to play the game, the 2-23-hour time period was identified through labeling the data with emergent coding method at the end of the content analysis. In the interview, two different categories emerged in terms of the time students spent while playing the game: playing without reading the content and the instructions of the serious game in detail, and playing the game after reading the instructions and fulfilling all the requirements of the course. One participant stated:

"I finished playing the game in four hours without reading the instructions. The second time I read the instructions and played the game noting down the information the course required. I played the game about one and a half hours every week and it took 12 hours in eight weeks."

In the interview, the participants indicated that it took them 12 to 23 hours to play the game when they fulfilled the instructions and the tasks required for the course.

They were asked why they noted down less words into their diaries although the game contained much more unknown words. The responses given by the participants for this question were divided into three categories using emergent coding method:

- 1) the appropriateness of the language level of the game,
- 2) the difficulty of noting unknown words,
- 3) believing that it was not necessary.

Two categories emerged regarding the language level of the game: language level of the game was low, and language level of the game was appropriate, however, the professional terminology in the texts made it difficult to understand. It was identified that the participants who noted down less words in the diaries because of the low level of the game were the students born and grown up in Germany before they came to Turkey. One participant indicated that the language level was appropriate for the target audience but the professional terminology in the texts made the game's content harder to understand.

One participant expressed the difficulty of noting down the unknown words as follows:

"Actually, I came across many unknown words. However, I kept playing the game because it was difficult to find them in the dictionary and to write in the diaries at the same time the sample German sentences where the words were used. Since I found noting down in-game exercises and their definitions boring and tiring, I did not write them either. I did not

write anything in the section for the new structures learned because there was not any new structure left since our courses in high schools and preparatory class."

One participant expressed why he found it unnecessary to note down the new words, structures and in-game exercises as follows:

"The purpose of the game was to learn the new words, so I just looked up in the dictionary to learn their meanings and solved the exercises on the screen. I thought it was not necessary to note them down in the diary."

The responses given by the participants for the question related with the difficulty level of the game mechanics were coded using emergent coding method and compiled under two categories: 1) the game was easy 2) the game was difficult at a specific point. One participant indicated this in the following words:

"I did not have serious problems with playing the game. I had a problem with downloading the game, but solved it with the help of a friend. When I pressed the replay button for the parts I did not understand, I had to go back to the beginning and listen to the whole section again because the game could not save the stage I worked on. This was quite boring."

During the game project, the participants were provided theoretical knowledge about DGBLL and they were informed that one of the noteworthy features of the games for students is multimedia in the field (soundtrack and visual design). Conversely, none of the participants noted down anything about the sounds of the game. When asked about the audio-visual characteristics of the game, one participant expressed the following words:

"I enjoyed the introductory sounds but played the rest of the game in the mute mode because the soundtrack was distracting and boring."

The participants were asked if they wanted to use digital games in their classrooms in the future. Most of them (86.7 %) responded as "Yes" and 13.3 % responded that they were not sure. The participants were also asked to justify their responses during the interview. Two categories emerged after the responses were coded using emergent coding method: 1) positive and 2) unsure. In the "positive" category, they indicated that digital games were more appealing than traditional course materials, and encouraged ubiquitous and autonomous learning. In the "unsure" category, they mentioned about technical problems and expressed that they were not sure whether such games would be interesting for students in the future. They also stated they have not decided to become a teacher yet. One participant with a positive approach expressed this as follows:

"Digital games are more enjoyable than the course book and films. I can play them anytime wherever I want, at home or at a café. Unlike the courses, I can determine the length and format of learning."

One participant who was not sure about using digital games in the future stated his ideas in the following words:

"The games do not work properly in all phones and tablets. You need to have access to internet while uploading and playing. Additionally, my phone is old and the game worked slowly. Every student needs to have a good phone or tablet. It is also difficult to predict whether our student in the future would like such games or not."

Another participant who was not sure indicated:

"I am not sure whether I would work as a teacher after my graduation. That is why I have no idea on using digital games."

The social network site (Auftrag, 2015) created in order to share the experiences with the game was not used by the participants. The in-class interviews revealed that the

participants did not have time to share their experiences through the web site, and they believed asking for help from friends was more efficient and faster.

DISCUSSION

The study aimed to identify the contributions of the game to the pre-service teachers' vocabulary size and language competence and to contribute to the teachers' qualifications in terms of digital game-based language learning. The results of the study revealed that there was a significant difference between pre and post-tests in terms of their vocabulary size. It is concluded that the game 'A Mysterious Mission' contributed to the participants' success. This result was expected and consistent with the previous successful studies in the field of DGBLL (Kocaman & Kizilkaya Cumaoglu, 2014b; Peirce & Vade, 2010; Müller, 2012; Johnson, 2010). The findings are in accordance with the theoretical implications and suggestions which argue for the contribution of digital games to the pre-service teachers' vocabulary size and other language skills (Bernert-Rehaber & Schlemminger, 2013; Levy & O'Brien, 2006; Roy & Schlemminger, 2014; Neville et al., 2009).

The present study obtained various results regarding the effects of pre-service teachers' demographic features on their learning success. Many studies show that the youth is regarded digital natives and digital literacy and game literacy (being a gamer or non-gamer, playing games, playing frequency and length of playing time) superiorities of them are significant factors in learning through digital games (Peirce & Vade, 2010; Jantke & Hume, 2015). However, the results of the present study revealed that age had positive effects on both words that were known before the activities and the success of the new words learned during the game after the eight-week period. Pre-service teachers older than 25 were more successful than the two age groups 22-24 and 19-21. Other studies with young learners (9-14 ages) emphasize that there is a negative correlation between age and DGBLL success. In this study, the youngest participant was 19 years old, it is not logical to relate this group of participants with the young learners' studies previously conducted. In this study, the game was rather comprehensive (70-page scenario) and its content included business world, job application, presentation, and cultural elements and Western film elements unfamiliar to young learners. The game had less adventure and action features compared to entertaining fun COTS games. All these characteristics can be justified with the fact that the game addressed adult learners who are more responsible and felt greater responsibility than younger people. As the game was more appealing to adults than the young learners, it was possible to state that there is a relation between pre-service teachers' age and the success (pre- and post-test) as opposed to the results on the youth. Meanwhile, the present study is different from other studies which showed the effect of the game literacy on success, because being a gamer or a non-gamer (playing games, playing frequency and length of playing time) in this study had no effect on vocabulary learning. Thus, this result was consistent with the fact that only 39.13 % of the participants (n=18) played action-based COTS games with long scripts.

As it was stated in De Grove et al. (2011)'s studies, there was no gender differences in success in the present study. The present study also revealed that pre-service teachers' preferences of language instruction in English or German had no effect on their success. Since a large part of the game text (text, dialogue, in game exercises etc.) are included in the content of the game and target vocabulary are embedded into the game story, it was an expected result that language preference did not affect their success. Kocaman & Kizilkaya Cumaoglu (2014b) concluded that use of compensatory strategies has positive effect on success in their study with the young learners. In the present study, use of compensatory strategy (frequency in consulting on digital games in language learning, video, CALL-Ware etc.) had no effect on success. The level of the participants' digital literacy was high as they didn't have so many technical problems whether they played the game or not. All these issues considered until now are consistent with the fact that the game -A Mysterious Mission- is designed for adult learners of German.

Blamiere (2012), Chandler (2013), Gerber & Price (2013) and Yilmaz Ince & Demirbilek (2013) concluded that teachers/adult learners' digital literacy problem is an impeding factor in establishing the use of DGBLL, and they suggested having teachers experience games and establishing courses to introduce game based learning so that use of games becomes more prevalent and productive. Diaries and face to face in class interview revealed that the participants found the game beneficial both as a teacher and a learner. Majority of the students (86.7 %) stated that they wanted to use the games for their future classes with their learner groups. Dealing with the games in teacher education programs both theoretically and practically, experiencing games and activities on their own are important for spreading the implementation of the DGBLL. Pre-service teachers who receive the training may assist their colleagues in the future.

Backlund & Hendrix (2013) stated that there is no longitudinal study in the field showing the contributions of the games into language learning progress. The findings gathered from the present study are the first step of the longitudinal study and planned to sustain through integrating reading, comprehending the game texts, grammar, material adaptation and design courses and creating new activities. (e.g. reading, transcription, or game making as suggested by Bermingham et al., 2013, etc.). This is important in terms of the suggestion Gerber & Price (2013) and Karadag (2015) proposed; they indicate that it is actually not very crucial for teachers to have an in-depth understanding of video games, or knowledge of the multiple video game genres in order to design lessons of video games to develop literacy activities. They state that teachers can effectively create learning opportunities by using video games as both the core unit and supplemental piece in lessons if they can draw upon their experiences with digital literacy, literature, and language learning theories.

The present study establishes evidence that digital serious games should not be associated only with young learners and suggests considering serious games for adult language learners as well and integrating them into teacher training curriculum for enhancing DGBLL pedagogy through practical game applications with pre-service teachers. The integration of DGBLL into foreign language education curriculum is definitely recommended. It is important to conduct further studies examining the contribution of games for various languages and language skills in order to improve the use of DGBLL.

Ministry of National Education, and directors at schools and educational institutions in cities are recommended to provide in-service professional development workshops and games for language classrooms in order to spread their use among all teachers, not just for few teachers with IT abilities at primary, secondary and high schools.

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