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Kahoot! As a Formative Assessment Tool in Foreign Language Learning: A Case Study in Greek as an L2

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***Abstract*—Our study investigates the effectiveness of Kahoot! as a formative assessment tool in the consolidation of grammatical phenomena in adult foreign language learning. Kahoot! was used in a multilingual and multicultural learning environment, where A1-level Greek was the target language. An experimental quantitative methodology was employed to compare progress made by students using Kahoot! (experimental group) compared to those using traditional methods such as paper and pencil tests (control group). Pre-tests and post-tests were administered to both groups to check if students had better assimilated the grammatical phenomena they had been taught. The study was carried out in the Center for the Study of the Hellenic Language and Culture at the University of Ioannina (Greece). Overall findings reveal that both groups performance in the post-tests showed a statistically significant improvement, however there was not a statistically significant difference between the performance of the two groups.**

***Index Terms*—Kahoot!, Greek as a foreign/second language, formative assessment**

I. Introduction

The rapid development of new technologies has brought to the fore the integration of gamification in education (e.g. Hwang & Wu, 2012). According to Deterding, Dixon, Khaled and Nacke (2011), "gamification is the use of game design elements in non-game contexts" (p. 10). Several gamified applications have been designed, such as Audioboom, Brainscape, ClassDojo, Class Realm, Clickers, Course Hero, Duolingo, Edmodo, Kahoot!, Poll Everywhere, Quizlet, Quizizz, Socrative, Veri, Zondle. These have been applied to various educational disciplines and levels (schools, colleges, Higher Education), in subjects as diverse as chemistry (Pretorius, 2016), medical education (Ismail & Mohammad, 2017), and foreign language teaching and learning (Lam, 2014; Michos, 2017).

According to Wang (2015), there are three reasons to incorporate gamification in teaching. Firstly, it enables teachers to monitor student progress in real time (Sindre, Nattvig & Jahre, 2009) and provide immediate feedback (Spodark, 2010). Secondly, it results in the advancement of student skills that could not have been otherwise developed if traditional teaching methods were followed (Owston, Wideman, Ronda & Brown, 2009). Thirdly, it improves student learning, motivation and engagement. Consequently, gamification bridges traditional classroom-based teaching and learning with the digital world (Oomen-Early & Early, 2015).

The present study aims to evaluate the effectiveness of gamification in adult foreign language learning. More specifically, we are interested in comparing the effectiveness of Kahoot! as a formative assessment tool versus traditional methods (i.e. paper-and-pencil tests), when monitoring student progress in the consolidation of grammatical phenomena. Kahoot! was used in an adult -multicultural and multilingual- foreign language teaching environment, the target language of which was A1-level Greek. We propose that Kahoot! may serve as a tool for formative assessment, necessarily alongside traditional methods.

The remainder of the paper is organised as follows: in section II.A we briefly outline gamification prior to providing a sketch of Kahoot! (II.B). Our experimental study and the statistical results are presented in section III, while the paper concludes in section IV.

II. Gamification

A. Background Information

Gamification has been widely discussed in the literature, as shown in Section I. In this section, we do not aim to offer

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an extensive literature review, but instead outline the benefits of gamification and briefly refer to studies which investigate the use of gamified tools in foreign language teaching and learning mainly in Higher Education.

Generally speaking, gamification contributes to the improvement of the learning environment that further enhances knowledge acquisition (Papastergiou, 2009). Learning outcomes and classroom dynamics are also positively affected (Rosas et al., 2003). It may also trigger changes in students' attitudes and behaviours as well as address the educational needs of different types of learners (Lee & Hammer, 2011). Well-designed gamified tools may increase student learning achievements (Hwang, Sung, Hung & Huang, 2013) and learning performance (Jang, Park & Yi, 2015) as they allow students to review class content (Icard, 2014).

Moreover, students are attracted by the competitive nature of games, they learn to handle success and failure and they also learn how to use critical thinking and problem-solving skills (Icard, 2014). Students show a positive attitude towards the incorporation of gamification in the learning process (Galbis-Córdova, Marti-Parreño & Curras-Pérez, 2017) for several reasons; i.e. gamification is entertaining, it reduces stress during assessment (Barrio, Munoz-Organero & Soriano, 2016), it increases student engagement and motivation (Dickey, 2011; Lee & Hammer, 2011) as well as group communication and co-operation (Lekka, Sipsas & Pagge, 2013). Teachers also feel positive about the incorporation of gamification in the learning process as it increases student productivity and creativity (Sanchez-Mena, Marti-Parreno & Aldas-Manzano, 2016).

The vast majority of studies about gamification mainly explore students' perceptions on issues such as: a) Does gamification increase student motivation, participation and self-assessment? b) Does gamification add a fun element in the teaching process? c) Does gamification provide immediate feedback? d) Does gamification contribute to learning?

Other studies evaluate student performance in gamification. Gamification may result in students' scoring better in assessed work or exams (Barata, Gama, Jorge & Gonçalves, 2013; Borrell, Cosmas, Grymes & Radunzel, 2017; Jang, Park & Yi, 2015) or it may result in no improvement (Long & Aleven, 2014; Hanus & Fox, 2015). The small number of participants or the short period of time over which some studies were implemented might have influenced the results.

Gamified tools have been incorporated in foreign language teaching and learning (i.e. Hasegawa, Koshinon & Ban, 2015). Emphasis is often placed on vocabulary learning (Faisal, 2017; Medina & Hurtado, 2017) or reading compliance (Rodríguez-Prieto, 2014) in languages such as English or Spanish in various educational settings (i.e. Primary Education, Colleges, Higher Education). Fewer studies investigate the role gamification plays in grammatical content learning (i.e. Michos, 2017). Once again, these studies primarily examine students' perceptions about the effectiveness of gamified applications on issues such as motivation (i.e. Liu & Wang, 2017). Overall, they show that students believe that gamification contributes to language learning.

Generally speaking, quantitative research studies which address the question of whether gamification actually improves language learning do not seem to reach a unified conclusion. According to Faisal (2017), students do not benefit significantly from the application of mobile augmented reality in foreign language learning, despite the fact that their motivation is increased. Rodríguez-Prieto (2014) found that the use of Clickers in a Spanish foreign language class did not result in students' better performance as far as reading compliance is concerned. On the contrary, Medina and Hurtado (2017) conclude that students' mean scores in vocabulary learning activities were increased and, in line with the findings of Abrams and Walsh (2014), gamification also increased students' vocabulary knowledge.

B. Kahoot!

Kahoot! is a free game-based digital platform which has been developed by the Norwegian University of Science and Technology (https://kahoot.com/). It contains design features which entice learning activities (points, leaderboards, timelines, sound effects, nicknames). Teachers create quizzes, discussions, and/or surveys in a simple and straightforward guided way. Quizzes may include multiple-choice questions, pictures and videos. A time limit may be set (from 5 to 120 seconds) for each question. Once a quiz is created, teachers may randomise the order of the questions and they can choose to make their quiz public or private. Students may or may not earn points for each question they answer correctly, depending on the settings teachers apply. When a task is completed, a leaderboard of the top players is displayed. Students' scores may be saved in an excel file which allows teachers to monitor student progress. In class, all you need is a computer, a projector and internet access. Teachers log in their Kahoot! account in order to activate the quiz. Students use their personal devices (a web browser is required) and gain access to the quiz by inserting a pin for the game. They can use their real names or nicknames and can participate as individuals or as a group. Throughout the gaming process, sound effects may further create an exciting and playful atmosphere (see also Mu and Paparas (2015) for a description of how to use this tool and Boden and Hart (2018) for an overview of the tool's strengths and weaknesses).

Kahoot! has been incorporated in various educational disciplines, such as chemistry (Pretorius, 2016), computer programming (Fotaris, Mastoras, Leinfellner & Rosunally, 2016), foreign language learning (i.e. Budiati, 2017; Dellos, 2015; Iaremenko, 2017; Medina & Hurtado, 2015; Zarzycka-Piskorz, 2016), medicine (Ismail et al, 2019), psychology (Iwamoto, Hargis, Taitano & Vuong, 2017).

Generally speaking, Kahoot! is a useful and pleasant tool. It is not a one-way teaching tool where teachers ask questions which need to be answered by individual students. All students are invited to respond to questions in real time and, simultaneously, they compete with each other. They also receive immediate feedback. Teachers may pause the quiz and discuss answers with the class. So, Kahoot! promotes active student learning as it focuses on student

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engagement, motivation, collaboration and knowledge sharing through a gaming experience (Dellos, 2015; Licorish, George, Owen & Daniel, 2017). The interested reader is referred to Wang and Tahir (2020) for a review of studies on Kahoot!.

III. The Study

In our study, we aim to investigate the effectiveness of Kahoot! as a formative assessment tool in adult foreign language learning. Towards this end, we compare students' performance in tests carried out in Kahoot! versus traditional methods (i.e. paper-and-pencil tests). We focus on the consolidation of grammatical phenomena at an A1-level (based on the Common European Framework of Reference for Languages) in Greek, a morphologically rich language. Our research hypothesis is based on the view that students' performance in Kahoot! is equal to their performance when traditional assessment methods are applied, given the fact that Kahoot! is a tool which serves the purposes of formative assessment by definition.

A. Methodology

The tool's effectiveness was tested in a multilingual and multicultural learning environment at the Center for the Study of the Hellenic Language and Culture at the University of Ioannina in Greece during the academic years 2017-2019. The target language was A1-level Greek. The sample consisted of students who participated in language learning educational programmes. The same curriculum and teaching materials were adopted. Students had a similar educational background (Tertiary Education). Their first languages were different. They were also learning Greek for different reasons. The survey was carried out with the help of the two class teachers.

The assumptions and the conceptual and functional definitions of the research were first set. The data collection tools (pre- and post-tests) were constructed, taking into account the specifications, the type and number of questions, and the conditions. Sixty-six participants were chosen by random sampling and divided into two groups: a control group (traditional formative assessment – paper and pencil test) of thirty-four students and an experimental group (Kahoot!) of thirty-two students. Both groups participated in a pre-test and a post-test in order to examine the progress students made on the basis of the feedback they received following the completion of the pre-test. More specifically, during 2017-2018, both the control group and the experimental group consisted of seventeen students each. In 2018-2019, the control group consisted of seventeen students whereas the experimental of fifteen students. A total of forty-nine students were female and seventeen male; twenty-six females and eight males (2017-2018), twenty-three females and nine males (2018-2019). The tests were conducted in the same teaching weeks during both academic years and students were tested on the same grammatical phenomena and items previously taught in classes (i.e. present tense verbs, nouns in nominative and accusative (singular and plural)).

The control group completed the pre-test in class and received feedback in the next class, once the tests were marked by the teachers. In order to improve the teaching and learning process, teachers praised students' efforts and referred to common mistakes, revised the necessary materials and gave students the opportunity to ask further questions. As far as the experimental group is concerned, the majority of the participants had not used Kahoot! prior to the implementation of the study. Students in this group participated in a Kahoot!-test session to familiarise themselves with the gamification tool. Once this session was completed, the experimental group completed the pre-test. Once a question was completed, teachers paused the quiz and asked students to provide explanations in reference to the (in)correctness of their answers. Where necessary, further explanations were given by the teachers. In this way, students received immediate feedback and revised the teaching material. In the post-test, students did not receive any feedback from the teachers while they were completing the quiz.

B. Results

Collected data were analysed using an independent t-test with p-value as well as a paired sample t-test. The differences in means, standard deviations and standard error means between the control and the experimental group were examined. The overall results of the analysis are presented in Figure.1.

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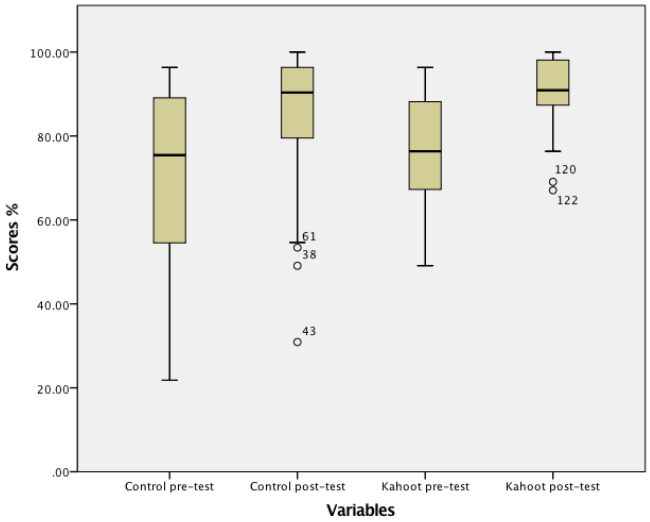

Figure 1. Group statistics visualisation

Firstly, we were interested in evaluating students' performance in the pre-test and the post-test in the control versus the experimental group. Levene's test was run to test the quality of variance between the two groups (Table.I).

In line with the results presented in Table.I and since the Sig. (2-tailed) is >0.05 both in the pre-test (p = .084) and the post-test (p=.079), we conclude that there is no statistically significant difference in the performance of the control versus the experimental group.

TABLE. I
INDEPENDENT T-TEST FOR BOTH GROUPS

		Levene's test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
pre-test	Equal variances assumed	17.902	.000	1.757	64	.084	8.12083	4.62164	-1.11197	17.35362
	Equal variances not assumed			1.787	51.572	.080	8.12083	4.54498	-1.00114	17.24279
post-test	Equal variances assumed	10.989	.002	1.784	64	.079	6.06278	3.39919	-.72789	12.85344
	Equal variances not assumed			1.817	49.193	.075	6.06278	3.33707	-.64265	12.76820

Next we ran a paired sample t-test in order to investigate students' progress in the pre-test and the post-test in the control and the experimental group, respectively. The results of the analysis are presented in Table.II.

TABLE. II
PAIRED T-TEST

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Control_pre-test	69.0382	34	23.11796	3.96470
	Control_post-test	84.1094	34	17.29281	2.96569
Pair 2	Experimental_pre-test	77.1591	32	12.57043	2.22216
	Experimental_post-test	90.1722	32	8.65463	1.52994

The mean score of the control group in the pre-test was M= 69.0382 (SD=23.11796) while in the post test it was M=84.1094 (SD=17.29281). On the other hand, the mean score for the experimental group in the pre-test was M=77.1591 (SD=12.57043) whereas in the post-test it was M=90.1722 (SD=8.65463). Students' performance in the post-tests improved, with a positive correlation in both groups, as shown in Table.III.

TABLE.III
PAIRED T-TEST - CORRELATIONS

		N	Correlation	Sig.
Pair 1	Control_pre-test_post_test	34	.762	.000
Pair 2	Experimental_pre-test_post-test	32	.676	.000

Since the Sig.(2-tailed) is <0.05 (p=.000) in both the control and the experimental group, as shown in Table.IV, there

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is a statistically significant difference in the students' performance in the pre-test and the post-test in both groups.

TABLE. IV
PAIRED T-TEST – DIFFERENCES

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Control_pre-test Control_post-test	-15.07118	14.97696	2.56853	-20.29688	-9.84547	-5.868	33	.000
Pair 2	Experimental_ pre-test Experimental_ post-test	-13.01313	9.26195	1.63730	-16.35241	-9.67384	-7.948	31	.000

Consequently, it seems that both methods of formative assessment had a positive effect on the students' performance in the consolidation of grammatical phenomena in adult foreign language learning.

IV. DISCUSSION - CONCLUDING REMARKS

Teaching and learning a foreign language is a rewarding and, at the same time, a demanding process during which teachers and learners are in constant interaction. Amongst other things, teachers have to create learning environments which address the educational needs of different types of learners. One of the ways that teachers achieve this is through the teaching materials and tools they use as well as their teaching methods. The increasing impetus of information and communication technology in classrooms further provides teachers with educational tools -e.g. gamification- that create an effective teaching and learning experience. As we have already seen in the previous sections, there are several benefits to using gamification. Gamification tools increase student knowledge, motivation and engagement. They also create an active commitment that supports problem solving skills in teaching environments and cultivates students' abilities to learn from their mistakes in a safe learning environment. The positive effects of gamification are often depicted in students' scores. Consequently, research studies should address the question of whether gamification can be used as tools to measure students' learning progress.

In our study, we investigated the effectiveness of Kahoot! as means of formative assessment in the consolidation of grammatical phenomena (at an A1-level) in adult foreign language learning. Our aim was to test whether Kahoot! is as effective as traditional assessment methods. Our working hypothesis, namely students' performance in Kahoot! is equal to their performance in paper-and-pencil tests, was confirmed. According to the analysis of the quantitative data, it was found that the students' performance in Kahoot! showed no statistically significant difference when compared to the students' performance in the paper-and-pencil tests. Simultaneously, students' performance in both groups increased in the post-tests. We can thus suggest that Kahoot! may serve as a method of formative assessment in the consolidation of grammatical phenomena in adult foreign language learning, alongside traditional ones (paper-and-pencil tests). The latter can be used to further test student performance on grammar through exercises which focus on students' writing skills. The effectiveness of Kahoot! as a suitable tool for formative assessment was also depicted in the study of Ismail et al. (2019).

Moreover, our findings -on the basis of students' performance in the Kahoot! pre- and the post-tests- are in line with previous reports in the literature as far as foreign language learning is concerned. Kahoot! increased students' performance in English (Wichadee & Pattanapichet, 2018), in reading compliance (Rodr ́guez-Prieto, 2014) and in vocabulary knowledge (Ciaramella, 2017; Klimova & Kacetl, 2018). Moreover, Iwamoto, Hargis, Taitano and Vuong (2017) found that Kahoot! had a positive impact on psychology students' academic performance. In the study of Şad and Özer (2019), it is reported that students who participated in a teacher education programme scored higher marks in assessment through Kahoot!

As it has been noted by Wang and Tahir (2020), "Kahoot! can have a positive effect on learning compared to other tools and approaches and for various contexts and domains. All studies that include statistical significance tests and effect sizes support this conclusion" (p. 9). Through Kahoot! students can revise newly acquired teaching material and can also receive rich and immediate feedback. Additionally, they feel positive about the use and the benefits of the gamification tool in class, as shown by Dellos (2015) who used Kahoot! in English learning classes. Fotaris, Mastoras, Leinfellner and Rosunally (2016) also found that students' engagement and learning experience are positively affected by the use of Kahoot!, when the tool was used in a university computer programming course. Similar conclusions were reached by Michos (2017), who used Kahoot! in a Spanish language course. He found that students believe that it increases motivation and is effective as a review activity for grammar and vocabulary. In addition, Zarzycka-Piskorz (2016) investigated university students' perceptions about English grammar learning through the gamified tool. In her study, students were positive about Kahoot!, as it made the learning process more effective and funny. The effectiveness of Kahoot! for the enhancement of language skills and students' classroom engagement when applied to a university English course was highlighted by Muhridza, Hazwani, Rosli, Sirri and Samad (2018). According to Tewthanom (2019), Kahoot! is an effective tool for improving pharmacy students' learning skills.

As we have already seen, students' performance in Kahoot! fits the general picture of the effectiveness of

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gamification in education; i.e. students achieved better scores in the studies of Barata, Gama, Jorge and Gonçalves (2013), Borrell, Cosmas, Grymes and Radunzel (2017) and Jang, Park and Yi (2015), and gamification resulted in the increase of vocabulary knowledge according to Abrams and Walsh (2014).

Prior to reaching our conclusion, we acknowledge the limitations of the study, i.e. the number of the tests that are to be carried out over an extended period (e.g. semester) or the involvement of more participants from diverse backgrounds.[1] We, therefore, propose that the utilisation of Kahoot! in education, and more specifically in foreign language teaching and learning, can be only seen as a positive addition to the teaching and learning process. It goes without saying that by no means do we suggest that gamification tools should be solely used for student assessment. Rather we claim that traditional formative assessment methods can be enriched through the use of gamification tools, bearing in mind the positive effects of gamification in relation to student engagement, motivation, collaboration and knowledge sharing (Dellos, 2015; Licorish, George, Owen & Daniel, 2017).

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[1] The reason for which any greater positive effects in the experimental group's performance were not observed, given the benefits of gamification as exemplified in the literature, might be related to the limitations of the study.

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