






## The Impact of Socratic Exit Tickets on Initial Teacher Training

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### ABSTRACT

The purpose of this research is to investigate the opinions of future teachers on their experience using *Socratic* exit tickets in the university classroom. For this purpose, the *Socratic* program was implemented as a learning tool within the education programs of two large universities in Spain, and a questionnaire was created by adapting instruments from previous research. The results show that the use of exit tickets improves the participants' reported attention and perceived abilities to reflect on, synthesize and analyze the course content. In addition, the use of *Socratic* facilitates instructors in identifying the degree of understanding or difficulties of students.

### KEYWORDS

Active learning;  
educational technology;  
higher education;  
*Socratic* software;  
technology integration

### Introduction



The expansion of the use of information and communication technologies (ICTs) in recent decades has led some educational institutions to attempt more personalized teaching through the use of mobile devices (Martínez 2016; Paz-Albo 2017), thus facilitating students' active and autonomous learning (Altuzarra, Galvez, and Gonzalez 2018). In this way, the integration of new methodologies into education has required the adaptation of teachers at all educational levels. Therefore, it is essential to teach future educators how to address the challenges of digital technologies to effectively guide students during the teaching-learning process (Viñals and Cuenca 2016).

Authors such as F. J. Fernández and M. J. Fernández (2016) point out that the presence of ICT in schools and students' capacities in these areas do not guarantee the development of digital competence; furthermore, they affirm that the key to developing students' skills in these areas lies in the technological and pedagogical competencies of teachers. Therefore, the training of future teachers in digital skills is necessary to improve the implementation of ICTs as educational tools in the classroom.

According to Bellver (2016), it is necessary to include training in such areas as digital competence so that future teachers can make timely decisions

about the teaching and educational practices they will develop in the classroom. Thus, in the technological-pedagogical field, future teachers must acquire the necessary skills to improve motivation and active participation during teaching-learning via ICT tools. In addition, as has been confirmed in recent years, Internet use is very common among Spanish youth aged 16 and 24 years, with 99.2% of males and 99.0% of females in this age group reporting that they use the Internet; nonetheless, there is still a digital divide arising from a lack of ICT knowledge (INE 2019).

However, it has been verified that new teaching-learning scenarios are arising in academic environments and are increasingly used interactively by students (M. Gómez 2017; Nobre and Martin-Fernandes 2018). The seemingly unstoppable expansion of the integration of ICT into teaching has become an educational priority (OECD 2013; Paz-Albo 2014). In addition, as Mercader and Gairín (2017) pointed out, the incorporation of digital technologies is a recurring theme in the field of education, but these technologies are poorly integrated into university classrooms (Marcelo, Yot, and Mayor-Ruiz 2015). One factor that can affect the integration of digital tools in this area is the high responsibility of teachers for deciding on the most suitable methodological strategies (Mercader and Gairín 2017), which not only leads

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to a change in the role of teachers (Viñals and Cuenca 2016) but places greater demands on their training and digital competence.

In this context, the UNIVERSITIC report (Gómez 2016) mentions that participation in university experiences related to ICT is increasing, and increasingly more universities are making it possible to connect to wireless networks (J. Gómez 2017), facilitating the digital transformation of learning. Likewise, the use of mobile devices in the university classroom is increasing given the favorable evolution of face-to-face teaching with a strong use of educational technologies both inside and outside the classroom (J. Gómez 2017). Universities, at the same time, are adopting *Bring Your Own Device* (BYOD) policies, which allow the use of personal mobile devices for teaching and learning (M. Gómez 2017; Paz-Albo and Hervás 2016).

In general, research has highlighted the potential and impact of digital tools such as the *Socrative* application within the university classroom and has examined how such tools favor the participation, collaboration and motivation of students (Balta, Perera-Rodríguez, and Hervás-Gómez 2018; Balta and Tzafilkou 2019; Medrano, Mosquera, and Melón 2018; Paz-Albo 2014; Paz-Albo and Hervás 2016). Learning through mobile devices is an emerging trend within the European Higher Education Area (EHEA), and different authors (see Anderson 2010; Paz-Albo 2014) have positively assessed this trend because it increases the active involvement of

students in the teaching-learning process. However, for the use of mobile technology to be successful, a pedagogical change in which innovation can be applied in the classroom is necessary (Anderson 2010). According to the foundations Fundación Telefónica and Fundación Itinerarium (2014), mobile learning can promote the commitment of students by encouraging motivation and the perception of their own learning and by enhancing student participation. Similarly, as pointed out by Dumont, Istance, and Benavides (2010), a key factor in improving learning is active student involvement and the use of applications such as *Socrative* that introduce a more motivating and active methodology in the university classroom (Medrano, Mosquera, and Melón 2018).

Several studies conducted within the EHEA (see Medrano, Mosquera, and Melón 2018) analyze mobile technology's potential for promoting active learning and its integration in the university classroom through applications such as *Socrative*, which has been evaluated positively. As Paz-Albo and Hervás (2018) describe *Socrative* is an online application that allows real-time interaction with students and builds knowledge through their active involvement, answering multiple choice, true-or-false and open-ended questions as they play space race games, take quizzes or exit tickets. Additionally, instructors can see their students' progress and answers, enhancing the immediacy of the feedback and facilitating an interactive environment for

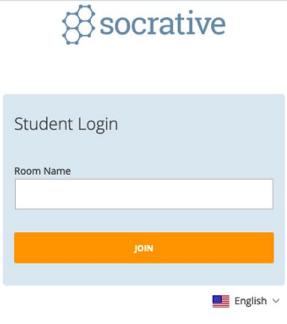
	<p>1 of 3</p> <p>How well did you understand today's material?</p> <p><input type="radio"/> A Totally got it</p> <p><input type="radio"/> B Pretty well</p> <p><input type="radio"/> C Not very well</p> <p><input type="radio"/> D Not at all</p>
<p>2 of 3</p> <p>What did you learn in today's class?</p> <p>Enter Answer Here</p>	<p>3 of 3</p> <p>Please answer the teacher's question.</p> <p>Enter Answer Here</p>

Figure 1. Example of a *Socrative* exit ticket. Screenshots by Paz-Albo from <https://socrative.com>.

teaching and learning (Fuad et al. 2018), a key element in improving the passive higher education classroom environment.

Thus, *Socrative* is a tool that allows students to become involve in class and presents opportunities for interactive activities, including pre-established questionnaires known as *exit tickets* (see Figure 1). These digital exit tickets allow an assessment of the information obtained during class through students' responses to three questions:

1. How well did you understand today' material? (Multiple choice)
2. What did you learn in today's class? (Open response)
3. Please answer the teacher's question. (Open response to any questions the teacher poses at the end of the class period)

Exit tickets offer an opportunity to improve the teaching-learning process because they allow a formative evaluation of the students' experience and encourage teachers to reflect and develop personalized interventions based on student responses. They can be implemented at no cost via the free version of *Socrative* or any other free in-person and online teaching software like Acadly, Top Hat and Poll Everywhere, rendering its use affordable for both teachers and students, or even on index cards. Several studies (Balta, Perera-Rodríguez, and Hervás-Gómez 2018; Medrano, Mosquera, and Melón 2018; Roger et al. 2017) highlight the potential of *Socrative*, and Paz-Albo and Hervás (2016) indicate that these formative evaluations favor involvement in the learning process and are very motivating. However, they require self-evaluation and self-reflection (Martínez-Izaguirre, Yániz-Álvarez, and Villardón-Galleg 2018; Sáez et al. 2013) by both teachers and students.

In addition, an understanding of students' perception of educational technology tools used in the classroom can help in teaching method development and curriculum (Davis, Misra, and van Auken 2000) and provide valuable feedback to faculty (Clarke, Flaherty, and Mottner 2001). Therefore, it is necessary to conduct research in the university classroom regarding the opinions of students to obtain data on the usefulness of the implementation of *Socrative* within the EHEA.

Under these assumptions, a general hypothesis that the use of *Socrative* promotes participation and favors learning and self-reflection by future teachers is proposed. Consequently, the objective of this research is

to understand future teachers' perceptions about the use of *Socrative* exit tickets in the teaching-learning process, particularly in the field of initial teacher training.

## Method

This research uses a mixed quasi-experimental and descriptive methodology to deepen the understanding of students' perceptions regarding the use of *Socrative* exit tickets in the university classroom. To this end, two university professors implemented the use of exit tickets at the end of each of their classes during November and December 2018. The classes are part of the initial teacher training curriculum at two of the largest public universities in the Community of Madrid: Rey Juan Carlos University (Universidad Rey Juan Carlos - URJC) with 46,639 enrolled students and the Complutense University of Madrid (Universidad Complutense de Madrid - UCM) with 71,806 in 2019 (El Mundo 2019). The exit tickets require students to answer three questions (Figure 1) at the end of each class to reflect on what was learned.

## Participants

A nonprobabilistic convenience sample design (Otzen and Manterola 2017) determined by the researchers' access to the subjects was used. An email invitation was sent to all potential 181 participants in the four courses for which *Socrative* exit tickets had been implemented, namely "School organization" and "Educational innovation and ICTs applied to the teaching of vocational guidance and training" at URJC, and "Adaptive curricular strategies" and "Educational programs and school organization and management" at UCM. A total of 91 students participated in the study (response rate of 50.28%); 10 were excluded for only partially completing the data, resulting in a final sample of 81 (completion rate of 89.01%). The ages of the participants were between 18 and 60 years ( $M=23.44$ ,  $SD=9.28$ ): 11 were men (13.58%), and 70 were women (86.42%). The presence of a greater number of women (Table 1) reflects the teaching field (Thornton and Bricheno 2000), which

**Table 1.** Characteristics of research participants by university.

	Men ( $n=11$ )	Women ( $n=70$ )	Total ( $N=81$ )
Universidad Rey Juan Carlos	6	26	32
Universidad Complutense de Madrid	5	44	49

is characterized by higher numbers of female teachers at the early childhood and primary education levels (83.6%) and in secondary education and vocational training (58.6%) in Spain, and these figures are below the OECD average (Roca et al. 2019).

### Instrument

We created a questionnaire for measuring the experience with implementing *Socratic* exit tickets as a learning tool in the university classroom by adapting instruments from Paz-Albo and Hervás (2018) and Paz-Albo (2014). In the end, the adapted questionnaire comprised 22 items distributed into a section collecting sociodemographic data (items 1-5) and two subscales measuring the students' experience with *Socratic*: Improvement resources (items 6-13) and help resources (items 14-19). In addition, a negatively worded item (item 19) that evaluates the effect of *Socratic* use on the students' attitudes was included to detect the possible existence of bias, such as social desirability, in the participants' responses. Responses were given on a 5-point Likert scale from 1 (i.e., totally disagree) to 5 (i.e., totally agree). The questionnaire also included two closed-ended questions (items 20 and 21) and an open-ended question (item 22) to allow students to expand on the usefulness of *Socratic* and improvements resulting from its implementation.

The internal consistency index for both the overall scale and the two subscales indicates excellent internal consistency for applied research (George and Mallery 2003). The internal consistency (Cronbach's alpha) of the instrument obtained an  $\alpha = .940$  for the questionnaire in general, an  $\alpha = .963$  for the improvement resource subscale and an  $\alpha = .903$  for the help resource subscale.

### Data collection

Data collection took place in December 2018 and January 2019. An initial email invitation was sent to all participating students with a description of the purpose of the study, and a request to complete the online survey, designed with *encuestafacil.com*, containing the informed consent form, which explained the nature of the research and the possible benefits, foreseeable risks and possible discomforts associated with participation in the study. The students were informed about data protection and the right to participate or abstain from participating in the research and to withdraw their consent at any time. In all cases, the informed

consent of the participants was obtained. The procedures of this research were approved by CEIC Hospital Clínico San Carlos Research Ethics Committee, approval number 18/545-E.

### Data analysis

Data from the survey items were analyzed using SPSS (Version 25.0). The techniques used included descriptive analysis using frequency analysis, factor analysis, Cronbach's alpha and mean contrast (*t*-test for independent samples) to determine the influence of the independent variables. In addition, to confirm the Student's *t* distribution of the data, nonparametric tests were used, the Mann-Whitney U test was applied to analyze differences according to university, and the effect sizes of the tests are presented (coefficient of correlation, *r*). In addition, Fisher's exact tests were performed for the data from the closed-ended questions. The qualitative study was based on a content analysis of the open-ended responses to the questionnaire.

### Results

The analysis of the collected data shows that the majority of the students had a positive perception of the use of the *Socratic* exit tickets (values above 2.9) as both an *improvement* resource (items 6 to 13) and a *help* resource (items 14 to 19) in the learning process (Table 2). For the Likert scale responses, mean (*M*) and standard deviation (*SD*) were used as measures of central tendency and dispersion, respectively.

#### *Socratic* as a resource for improvement

Item 7 had the highest mean of all items (3.43), with "agree" as the most frequently reported value (*MO*=3). The standard deviation reflects the diversity of the responses (*SD*=1.10) and indicates a high degree of agreement that attention in class improved when *Socratic* was used. Additionally, the other items that make up the improvement construct all had very positive values. However, to determine whether there were significant differences according to age and university, a comparative analysis of the means and standard deviations of the improvement construct was performed.

The results show that there were significant differences between university subgroups in two variables: "6-motivation" [ $t_{72,462} = 3,425, p = .001$ ] and "7-attention" [ $t_{71,376} = 3,422, p = 0.001$ ]. The effect size of these variables was moderate ( $r = .35, p = .001$

**Table 2.** Descriptive analysis of the scale items.

	UCM (n=49)		URJC (n=32)		Total (N=81)	
	M	SD	M	SD	M	SD
6. It has improved my motivation.	2.94	1.13	3.75	0.98	3.26	1.14
7. It has improved my attention in class.	3.12	1.07	3.91	0.96	3.43	1.10
8. It has improved my performance in class.	3.06	1.11	3.44	0.98	3.21	1.07
9. It has improved my behavior during class.	3.06	1.14	3.38	1.01	3.19	1.10
10. It has improved my attitude toward learning.	3.18	1.17	3.63	1.07	3.36	1.14
11. It has improved my understanding of the content.	3.14	1.12	3.38	0.98	3.23	1.06
12. It has improved my communication with the teacher about difficulties.	3.12	1.15	3.56	0.95	3.30	1.09
13. It has improved my memorization of the class content.	3.06	1.07	3.69	1.03	3.31	1.09
14. It has helped me reflect on new content explained in class.	3.37	1.11	4.09	0.89	3.65	1.09
15. It has helped me identify difficulties in understanding the content.	3.02	1.11	3.66	0.97	3.27	1.10
16. It has helped me analyze and synthesize the content explained in class.	3.22	1.05	3.63	0.98	3.38	1.03
17. It has helped make classes more dynamic.	3.33	1.21	3.88	1.07	3.54	1.18
18. It has helped the teacher to identify students' degree of understanding and/or difficulties.	3.31	1.18	3.91	0.89	3.54	1.11
19. It has not had any effect on my attitude toward this class. <sup>a</sup>	2.71	1.16	3.69	1.06	3.10	1.21

<sup>a</sup>Item was recoded positively.

and  $r = .352$ ,  $p = 0.001$ , respectively). No significant differences were found for the rest of the variables. These data were confirmed using the Mann-Whitney U test (Table 3).

On the other hand, we applied Fisher's exact test to the closed-ended question "Do you think that the use of *Socratic* has increased your motivation for learning?" (related to the "6-motivation" variable of the improvement construct) to determine the difference ( $p = .012$ ) between the two universities. A total of 65.6% of the URJC students believed that their motivation increased due to the use of *Socratic*, compared to 35.4% of the UCM students under the same conditions.

We performed a Pearson correlation analysis to examine the associations between age and the construct of improvement and observed that there were weak correlations ( $p < .01$ ). As Table 4 shows, age was positively related to the scores obtained for all items of the improvement construct and contributed to the participants' perception of the *Socratic* exit tickets as a resource for improvement in motivation (item 6) and attention (item 7).

### *Socratic* as a help resource

The responses obtained reflect a high degree of agreement in the perception of *Socratic* as a tool for obtaining help in the university classroom. All the

items in the *help* construct received very positive values, and item 14 had the highest mean (3.65), with "strongly agree" as the most frequently reported answer ( $MO = 4$ ;  $SD = 1.09$ ). A Student's *t*-tests analysis was performed to determine whether there were significant differences according to age and university.

When the responses were analyzed by university, the results showed significant differences in "19-effect on attitude" [ $t_{70,343} = -3.897$ ,  $p = .000$ ]. The effect size of this variable was moderate ( $r = .396$ ,  $p = .000$ ). Significant differences were also found in "14-reflect" ( $r = .329$ ,  $p = .003$ ), "15-identify difficulties" ( $r = .285$ ,  $p = .010$ ), "17-dynamic classes" ( $r = .228$ ,  $p = .041$ ) and "18-degree of comprehension" ( $r = .267$ ,  $p = .016$ ). The Mann-Whitney U statistic confirms these data (Table 5).

Fisher's exact test was also performed on the responses to the final closed-ended question, "Do you think that the use of *Socratic* has helped you improve your learning?", and the results confirm the presence of significant differences ( $p = .000$ ) between the two university groups. A total of 78.1% of the URJC students reported that their learning improved due to the use of *Socratic*, compared to 36.7% of the UCM students.

Regarding age, we performed a Pearson correlation analysis to examine the associations between age and the help construct and found weak correlations ( $p < .05$ ). As shown in Table 6, age was positively related to the scores obtained for all the items of the help

**Table 3.** Mann-Whitney U test results for the improvement construct.

	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13
Mann-Whitney U	450.00	459.00	645.00	674.50	617.00	712.50	627.00	541.50
Wilcoxon W	1675.00	1684.00	1870.00	1899.50	1842.00	1937.50	1852.00	1766.50
Z	-3.369	-3.270	-1.403	-1.105	-1.675	-.726	-1.587	-2.458
Asymptotic sig. (bilateral)	.001	.001	.161	.269	.094	.468	.113	.014

Note. Grouping variable: In which university are you enrolled?



**Table 4.** Correlations for the improvement construct by age.

	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13
Pearson correlation	.323**	.295**	.119	.187	.149	.182	.101	.123
Asymptotic sig. (bilateral)	.003	.008	.290	.094	.186	.104	.372	.273

\*\* $p < .01$ .

**Table 5.** Mann-Whitney U test results for the help construct.

	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19
Mann-Whitney U	487.50	519.50	615.50	574.50	563.00	431.50
Wilcoxon W	1712.50	1744.50	1840.50	1799.50	1788.00	1656.50
Z	-3.003	-2.681	-1.704	-2.102	-2.225	-3.505
Asymptotic sig. (bilateral)	.003	.007	.088	.036	.026	.000

Note. Grouping variable: In which university are you enrolled?

**Table 6.** Correlations for the help construct by age.

	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19
Pearson correlation	.091	.048	.83	.222*	.084	.251*
Asymptotic sig. (bilateral)	.419	.669	.464	.046	.453	.024

\* $p < .05$ .

construct and contributed to the perception of *Socrative* exit tickets as a dynamizer (item 17) and activator of changes in attitude toward material presented in class (item 19).

### Advantages of *Socrative* in the university classroom

The use of *Socrative* in teaching practice has some drawbacks that the students highlighted in the open-ended question (“Please describe what you found most and least useful about *Socrative* and how its implementation in the classroom could be improved”). The main drawback was problems connecting to the platform. The participants also reported advantages of the app, including increased attention in class and increased participation.

In their responses to the open-ended question, the students noted that *Socrative* is a tool that “motivates you”; “it allows a didactic improvement”; “it is useful to synthesized the content and therefore keep the most important ideas”; it encourages students to pay “more attention in class”, “helps learning” and makes students “slightly more attentive to be able to explain what was learned in class”. In addition, the students indicated that *Socrative* also allowed them “to identify at the end of the class the knowledge learned and the possibility of doubts arising”; “it allows one to interact [...] to reflect on what has been learned” and provides “the immediacy to reflect on what is seen in class daily and to locate what I have understood and what I have gaps in”.

### Discussion

The results show that *Socrative* exit tickets help students reflect on what and how they learn, in addition to helping the teacher determine whether students have achieved a significant level of learning (items 14 and 18). Analysis and reflection enrich the students, as Rodríguez (2000) emphasizes in a discussion of competency and autonomous learning (M. Gómez 2017). The use of these technological tools in teaching-learning processes also invites instructors to reflect on and evaluate their digital competence; for M. Gómez (2017), such competence is essential but represents an implicit challenge in teaching practice, as Orozco et al. (2016) warn regarding the application of ICT in the classroom.

On the other hand, some data from the study are in line with those obtained by Paz-Albo (2014) and confirm that the use of *Socrative* allows the development of much more dynamic classes and increases students’ commitment to their learning (item 17). In addition, the exit tickets led to an improvement in skills that are applicable to different subjects, such as a positive attitude toward the content and greater attention and capacity for analysis in class (items 7, 10 and 16, respectively). However, as Mercader and Gairín (2017) also point out, the use of technology in the university classroom also requires an increase in student and teacher autonomy.

Furthermore, improvement in the understanding (item 11) and memorization of class content (item 13) was found. The students felt more secure and motivated (item 6) when interacting with the instructor and expressing their doubts (item 12), which allowed the

instructor to identify students' difficulties (item 18) and have greater knowledge about the development of their learning. This confirms the data provided by Bello and Merino (2017) and Paz-Albo and Hervás (2016), which indicate that student behavior and performance in class seem to improve (items 8 and 9).

In addition, *Socrative* facilitates greater access to information and clarifies doubts in a clear and immediate way, allowing positive feedback and reinforcement of what students have learned and providing guidelines for reorienting new learning.

The results show that this tool favors students' self-reflection on their learning and encourages active participation within the EHEA. The implementation of exit tickets requires the use of methodological strategies, such as those indicated by Bello and Merino (2017) and Pérez and Martínez-Aznar (2020), that make students the protagonist in constructing their own learning. In the university environment, ICT is being incorporated as a teaching support to achieve better learning by students, but as Imbernón, Silva, and Guzmán (2011) emphasize, teacher training policies that increase digital skills should be highlighted since the use of technology by itself does not ensure improvements (del Campo 2014).

In this same sense, our results show the presence of significant differences depending on the university. These differences maybe reflect the experience and technical-pedagogical training received by the instructors in charge of implementing the use of *Socrative* at the UCM because they were unfamiliar with the platform. In addition, as stated by Gómez and García (2016), teacher training is a key factor in the successful integration of new technologies into classrooms. Thus, we can observe how, in recent years, universities have promoted such training, which creates a new scenario for the didactic and pedagogical training of teachers. However, as indicated by Gómez and García (2016), there are advantages when implementing new tools, such as increased motivation and interest in the subject and greater interaction between students and teachers.

### **Implications and suggestions for future research**

The aforementioned results lead us to propose the possibility of expanding the scope of the study to other university classrooms as a future line of research to better understand the potential of ICT integration and verify whether the results can be replicated. In addition, as the literature shows, the mere presence of technological resources in classrooms is not enough to result in improvement. Instead, the focus should be on using

ICT tools to promote active and sustainable methodologies that do not involve an economic investment or significant material resources and are easy to apply in university contexts, to stimulate and respond to the need for individualized learning. More collaborative work is needed to explore the ways in which digital exit tickets enhance the students educational experience, and also to assess the feasibility of embedding these in the higher educational curriculum.

### **Limitations**

The reported study has several strengths but is not without limitations. First, although the process of implementing *Socrative* exit tickets was similar in both institutions, the instructors' technical-pedagogical training and familiarization with the tool were different since the URJC instructor has been using *Socrative* over the last few years, but the UCM instructor used it for the first time during the 2018–2019 academic year. Second, this exploratory study used a type of sampling that was determined in a specific academic context. Therefore, caution should be used when generalizing the conclusions.

### **Acknowledgment**

Authors would like to acknowledge the support received from the Vicerrectorado de Investigación at the Universidad Rey Juan Carlos.






### **Disclosure statement**

No potential competing interest was reported by the authors.

### **Funding**

This research was supported by the Universidad Complutense de Madrid under Innovation Project Grant No.3, 2018-2019. The authors received no financial support from *Socrative*.

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