Gamifying the 9 Events of Instruction with Different Interactive Response Systems: The Views of Social Sciences Teacher Candidates

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ABSTRACT

Gagne's theory posits that learning is achieved through interaction of various internal and external factors. If so, the use of supportive technology to provide these factors' interaction may increase expected performance, especially in theoretical courses, and place learning at a higher level. As supportive technology, gamification-based computer or mobile applications can be used in Gagne's nine instructional steps. Therefore, 23 teacher candidates in the Department of Social Sciences Education evaluated the use of gamification-based interactive response system (IRS) tools with the scope of Gagne's learning theory. For 3 weeks, teacher candidates were taught how to use Kahoot, Plickers, Socrative, Quizlet, and FlipQuiz tools in question-answer activities. Teacher candidates prepared materials or questions about predetermined topics for the IRS tools, and then chosen teacher candidates demonstrated to others how to use each tool. According to findings, Kahoot and Plickers can best be used in *gaining attention*, *assessing performance*, and *enhancing retention and transfer*, Socrative and Quizlet in *gaining attention* and *presenting the content* and FlipQuiz in *gaining attention*, *providing learning guidance,* and *assessing performance*. Also, teacher candidates determined some limitations of each tool. Finally, results were discussed and some recommendations for future research were stated at the end of the study.

Keywords: *Gagne's nine events; conditions of learning; gamification; interactive response systems; social sciences*

INTRODUCTION

In 21st-century teaching, mobile devices, three-dimensional printers, social networks, gamification, digital electronic books, digital video, student response systems, simulations, podcasting and lecture capture applications are considered the top 10 technologies (Tomei, 2017). Many of them are used in research studies in the social sciences education area as well as many other areas. Several recent studies have examined the impact of simulations in social sciences teaching (Walker, 2016), game use in geography education (Scarlett, 2015), and digital games, digital simulations, and video games in history teaching (McCall, 2016; Metzger & Paxton, 2016; Perrotta & Feinberg, 2016). These studies have found that technology provides new possibilities for learning social sciences content and skills in ways not possible in traditional classrooms. Certainly, in today's classrooms, social sciences teachers can use technology to expand learning opportunities for K–12 students (Berson et. al. 2000). With its use in the classroom, technology has increased students' interest because of their familiarity with it. Besides, increased entertainment during learning with technology relates to learners' natural proximity to technology. Not only does technology attract students to the learning

process, it also makes the instructional process more student- than teacher-centered (Heafner, 2004). Thus, social studies lessons interest students more if they include computers and the Internet as learning tools (Cassutto, 2000).

One of the classroom technologies is Clickers. Hung (2017) declared that use of Clicker in any learning activity completes classical courses in traditional classrooms, where teacher-student and student-student interactions are normally low. It appears that in fact, Clickers have laid the foundation of today's response systems. They are called as audience response systems (ARS), student response systems (SRS), or interactive response systems (IRS). Although they are not very common in the field of social sciences education, in recent years they are encountered in different fields of education. An IRS is a learning-centered, interactive, teaching–learning technology (Sun & Chen, 2016) that can be used to create questions and reflect the questions to a projection screen—sometimes with a mobile device (e.g., Kahoot, Socrative, Quizlet), sometimes on a personal computer or tablet (e.g., Kahoot, Socrative, Quizlet), sometimes verbally without any software (e.g., FlipQuiz), and sometimes using questions-response (QR) code cards (e.g., Plickers) to obtain answers to questions.

With the emergence of gamification, IRSs have gone beyond just responding to questions (Grevisse, Botev, & Rothkugel, 2017). Gamification is the use of game design elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011). It describes the characteristics of an interactive system that aims to motivate and attract users by employing game components and mechanics (Seaborn & Fels, 2015). It includes such game elements as goals, rules, tasks to be completed, immediate feedback, scoring, and level of difficulty (Boulet, 2012). Gamification is accomplished by transforming the classroom into television game shows in which students act as competitors, while the teacher plays the game-show presenter (Wang & Zhu, 2016). Applying gamification to the classroom can motivate students to learn in a new way, and it can make boring topics fun for students (Hanus & Fox, 2015). Similarly, the use of game-based IRSs focuses on attracting and motivating learners through interesting graphical user interfaces and sounds, as well as by simultaneously gamifying students' entire response experience (Wang & Zhu, 2016).

IRSs provide students immediate feedback during the learning process (Jones, Antonenko, & Greenwood, 2012), allow all students to participate actively in the classroom (Martyn, 2007; Graham, Tripp, Seawright, & Joeckel, 2007), increase participation and help students understand lessons (Sellehewa, 2011), interest students more in lessons (Gauci, Dantas, Williams, & Kemm, 2009), and contribute to active learning (Grevisse, Botev, & Rothkugel, 2017). These response systems are also used for the purpose of evaluation, especially for formative assessment (Hall, Bush, & Chamblee, 2015; Saglam, 2018). Considering these contributions of IRSs, it is obvious that they can be used for various aims in different steps of instruction process. Gagne's nine key instructional steps, which are a structured process model for effective classroom instruction (Weyers, 2006), need to be considered when planning the teaching process (Crane, 2016): (1) *gaining attention*, (2) *informing learners of objectives*, (3) *stimulating recall of prior knowledge* (4) *presenting the stimulus*, (5) *providing learning guidance*, (6) *eliciting performance (practice)*, (7) *providing feedback*, (8) *assessing performance*, and (9) *enhancing retention and transfer*. To explain each step, (1) teaching begins by attracting learners to course content because learning does not occur unless students are clearly directed to new knowledge. (2) Then learners are informed of instructional objectives; learners clearly aware of instructional objectives and ready to learn are more cautious about any stimulus related to course objectives. (3) In the next steps, learners are reminded of previous knowledge about the topic, and then (4) new information is presented. (5) Later, guidance about how to learn and retain knowledge is provided, so students can do meaningful coding. (6) Then to demonstrate their knowledge, learners need to show their performance. (7) In the next step, feedback provides learners with information about their performance, allowing them to perceive their knowledge and correct their mistakes. (8) Learners' performance is then formally assessed through a unit or chapter tests, projects, portfolios, skill demonstrations, and so on, depending on the topic's content (e.g., knowledge, skill, and attitude). (9) In the last step, various activities are conducted to increase retention and transfer; such activities can also be integrated into the previous instructional steps (Driscoll & Driscoll, 2005; Weyers, 2006).

Several studies about various IRSs have examined changes in subjects' variables such as motivation

(Cain, Black, & Rohr, 2009; Zarzycka-Piskorz, 2016), achievement (Bunce, VandenPlas, & Havanki, 2006; Sun & Chen, 2016), and engagement (Barstsch & Murphy, 2011; Kirsch, Marlow, Pingley, Leonhirth, & Lownes, 2016; Noel, Stover, & McNutt, 2015; Salemi, 2009). Other study studies have focused on IRS use to improve instruction (Shieh & Chang, 2013; Schön, Kopf, Klinger, & Guthier, 2016) or to facilitate teaching (Wang, 2017). A study that addresses Gagne's nine-step teaching process as a whole and examines steps during which IRSs can be used, and which of their features determine these uses, can fill a gap in the literature and contribute to the field.

Aim and the Importance of the Study

This study's general aim is to obtain social sciences teacher candidates' opinions about using each of five IRSs, while considering Gagne's nine instructional steps. For this study, IRSs, which have different features from each other, were considered and Kahoot, Plickers, Socrative, Quizlet, and FlipQuiz tools were chosen according to the study's duration. Because study participants were social science teacher candidates, the use of IRSs was evaluated within social studies courses. New teacher education curriculums were released from the higher education institute in Turkey and all departments have instructional technologies courses in their new curriculum. Combining different educational approaches with new technologies and using these technologies as a motivating, teaching and encouring tool in the educational environments is becoming more and more important. Thus, teacher candidates need to learn and use new technologies in their classrooms. Therefore, it can be considered that this study is important in terms of technology integration in different fields of teacher education.

Interactive Response Systems (Kahoot, Plickers, Socrative, Quizlet, FlipQuiz)

One well-known IRS, *Kahoot* is a free, game-based learning platform with an environment in which students can learn and play together. Quizzes, discussions, questionnaires, and an environment, which allows creating a game called Jumble, also provides the possibility of adding videos, pictures, and diagrams to questions (Kahoot, 2017). In Kahoot prepared activities on the teacher's screen are reflected students registered in the system via a pin code and nickname. Students see only symbols that identify answers, and they select answers by clicking on the symbol on their screens. Response times can also be determined for questions with a maximum of four replies. Students earn points according to their correct answers and the speed of their answers. After each question, a list shows how many points students have earned. After the activity is complete, results can be displayed onscreen as a scoreboard and then saved. This tool has free applications for Android and iOS. Instead of pencil-paper exercises, Kahoot allows teachers to give homework so that students see questions and answers on their phones, using their devices anywhere. Moreover, the system allows using quizzes prepared by other system users.

Plickers, separated from other IRSs by its QR code feature, is a free, web-based application that allows the teacher to perform real-time formative student assessment without needing tools. Through instant feedback, teachers can quickly check whether students comprehend broad concepts and develop key skills (Plickers, 2017). Teacher-prepared multiple choice (4 responses) and true/false questions are presented to students on the projection screen. The students answer the questions with QR code cards and the answers are scanned with a phone's camera, and instantly evaluated. Each edge of the card indicates one of four choices—A, B, C, and D. A maximum of 63 cards can be created from the Plickers web site. At the end of the activity, results are saved, and the user can access them from a reports section.

Offering a more formal environment than others, *Socrative* presents multiple choice, true/false, and open-ended questions in an online environment. IOS and Android applications are available. Like Plickers, Socrative enables teachers to evaluate immediately students' comprehension of prepared activities or questions (Socrative, 2017). After registering with the website, teachers create a room where students log in using the room name. The question screen shows the number of students in the room and the number of students who answer a question; students see their questions and answers on their devices (e.g., computer, tablet, mobile phone). Socrative provides an interface of settings on, for example, feedback, the order of questions, and progress type, all while presenting questions to students. Each activity's results can be viewed on the website, displayed as a chart, downloaded as an Excel or Pdf file, uploaded to Google Drive, or e-

mailed to anyone.

Quizlet, different in its number and variety of activities, is the largest online learning community in the world. Every month, more than 20 million active learners from 130 countries practice more than 140 million work sets in various subject areas (Quizlet, 2017). In this environment, activities, flashcards, exercises (vocal or written), tests, matching, games (e.g., individual, team, sync) can be created to assist in learning any topic. Mobile applications are available for Android and iOS. Quizlet offers up to eight classrooms free, and students may be invited to the classes. The upgraded Quizlet teacher account does not limit the number of classes (Quizlet, 2017). Teachers can upload pictures, diagrams, maps, voice messages, and lectures. Moreover, they can monitor how their students work and improve (James, 2016). With the Quizlet Live feature, a prepared application can be shared with a specific class, and students can learn while playing together, participating in the system with a code. In addition, the Quizlet environment allows students to access various activities prepared by millions of users from all over the world—apart from activities they or their teachers prepare.

FlipQuiz can be considered as the tool that has the narrowest scope among IRSs since it has only one type of activity. It is an online platform that enables teachers to create their own game-show style boards for classroom test reviews. Traditionally, game-show style boards were created using poster boards, chalkboards, PowerPoint, or dry-erase markers on overhead slides, and review questions were usually written on a separate sheet of paper. With this tool, questions are displayed onscreen. After the answering process, answers can be seen onscreen by clicking the 'reveal answer' button, and the boards are saved for reuse. FlipQuiz's colorful interface is likely to attract students' attention, so their interest can be maintained during the test review process (FlipQuiz, 2017). User registration is required to log in. Boards may be created in the free version, and the paid Pro version has scorekeeping and digital flashcard applications.

RESEARCH METHOD

Research Model

Exploratory case study was employed as a qualitative research in this study. It aims to obtain more information about a particular phenomenon. In this type of research, the collected data is expected to shape and guide future studies (Willis, 2008). In this study, it is aimed to take the views of teacher candidates to determine how to use IRS for gamification purposes for each of Gagne's nine events in the teaching process and which features of the IRSs influence the use of these tools. The results obtained from this study will become the source of the studies in which the effects of IRS use on nine events are investigated in depth.

Participants

This research was conducted in a public university's Social Sciences Teacher Education Department with 23 (13 female, 10 male) first-year students during the 2016–2017 spring semester course Information Technologies in Education (Table 1).

Table 1. Participants

		n
Gender	Male	10
	Female	13
	Total	**23**

Collection of Data

For the research in the course Information Technologies in Education, 3 weeks (4 hours a week) were reserved to introduce new technologies, in this case, IRSs and their use. During lessons in the computer laboratory environment, first, each IRS was introduced, its use was demonstrated by the instructor (one of the researchers), and the students were asked to use each IRS to create applications related to topics predetermined by the instructor. The teacher candidates/students created questions for activities, which

were presented by four to five randomly selected students, with participation by others in the class. Teacher candidates played both roles of social sciences learners and of teachers preparing and presenting activities, so they could evaluate tools from both perspectives. Students who would make presentations for each IRS were selected from students who had not previously made presentations.

Data Analysis

After the introduction, implementation, and presentation of all IRSs, students completed an open-ended questionnaire prepared by the researchers. Next, content analysis was performed on the gathered data. For the study's reliability and validity, two experts individually analyzed student responses. Then, two experts individually coded the data, compared codes, and coding that differed was discussed to reach consensus.

FINDINGS

Responses from social studies teacher candidates/students were analyzed considering implementation of Gagne's nine instructional steps, and, for each IRS tool, results were tabulated and interpreted. The nine steps were identified as themes, and responses from students were categorized in the appropriate theme. Moreover, student opinions on limitations of IRS tools in social studies courses were explained.

Student Views on Use of Kahoot

Table 2 displays an analysis of student opinions on the use of Kahoot in social studies, according to Gagne's nine steps.

Table 2. Teacher Candidate/Student Views on the Use of Kahoot

	Gagne's Events	Student Statements (Kahoot)	n
1	**Gaining attention**	Fun Interesting Increased attention	7 1 1
2	**Informing learners of objectives**	-	-
3	**Stimulating recall of prior knowledge**	-	-
4	**Presenting the content**	Quick knowledge transfer Made subjects concrete	1 1
5	**Providing 'learning guidance'**	-	-
6	**Eliciting performance (practice)**	Provided student activeness	2
7	**Providing feedback**	Provided feedback	2
8	**Assessing performance**	Well scored system Effective competition environment	3 1
9	**Enhancing retention and transfer**	Provided retention	4

Notably, 'fun' (7) and 'provides retention' (4) received more comments than the other steps/themes, but as Table 2 shows, some themes received no comments. Nine student statements referred to *gaining attention*, four to *assessing performance*, four to *enhancing retention and transfer*, two to *presenting the content*, two to *eliciting performance*, and two to *providing feedback*. Some examples of student statements follow:

- *[Kahoot] makes the lesson more effective and prevents [students'] breaking away from it.*

- *It was nice for everyone to participate with their computer or phone and not to interfere with each other.*
- *A simple and easy-to-use tool in the classroom.*
- *[Kahoot] can be applied in history lessons to keep war dates in mind.*

Further student responses noted Kahoot's limitation of requiring a mobile device or computer with Internet connection and of 'character limitations preventing writing long questions' (six students).

Student Views on the Use of Plickers

Table 3 displays analysis of student opinions on the use of Plickers in social studies, according to Gagne's nine steps.

Table 3. Social Studies Teacher Candidate/Student Views on Use of Plickers

	Gagne's Events	Student Statements (Plickers)	N
1	**Gaining attention**	Fun Interesting Like a game Attractive	4 2 1 1
2	**Informing learners of objectives**	-	-
3	**Stimulating recall of prior knowledge**	-	-
4	**Presenting the content**	An instructive application	2
5	**Providing 'learning guidance'**	Provided guidance	1
6	**Eliciting performance (practice)**	-	-
7	**Providing feedback**	Provided quick feedback	1
8	**Assessing performance**	Challenging environment improved participation Competition environment	2 1
9	**Enhancing retention and transfer**	Provided feedback	3

Notably, 'fun' (4) and 'provides retention' (3) received more comments than the other steps/themes, but as Table 3 shows, some themes received no comments. Eight student statements referred to *gaining attention*, three each to *assessing performance* and *enhancing retention and transfer*, two to *presenting the content*, and one each to *providing learning guidance* and *providing feedback*. Some examples of student statements follow:

- *A very important application for students to attend to lessons without technological devices*
- *[Plickers] provides more convenient use in a classroom environment.*
- *The most useful application for social studies courses*
- *Students actively participated; the tool provides both mental and physical activity.*

'No need for a technological device' had the highest frequency among students (12). Further student responses noted Plickers's 'difficulty in time-saving' and 'a long time while scanning QR code cards.'

Student Views on Use of Socrative

Table 4 displays analysis of student opinions on the use of Socrative in social studies, according to Gagne's nine steps.

Table 4. Social Studies Teacher Candidate/Student Views on the Use of Socrative

	Gagne's Events	Student Statements (Socrative)	n
1	**Gaining attention**	Fun Attractive	5 2
2	**Informing learners of objectives**	-	-
3	**Stimulating recall of prior knowledge**	-	-
4	**Presenting the content**	Provided various response types	8
5	**Providing 'learning guidance'**	-	-
6	**Eliciting performance (practice)**	-	-
7	**Providing feedback**	Provided quick feedback	1
8	**Assessing performance**	-	-
9	**Enhancing retention and transfer**	Provided retention	2

Notably, 'the advantage of having different response types' (8) and 'fun' (5) received more comments than the other steps/themes, but as Table 4 shows, some themes received no comments. Eight student statements referred to *presenting the content*, seven to *gaining attention*, two to *enhancing retention and transfer*, and one to *providing feedback*. Some examples of student statements follow:

- *[Socrative] is instructive in courses of social studies, and its knowledge transfer is impressive.*
- *It can be easily used in history courses with different response choices.*
- *It is more suitable for use in verbal courses.*

Socrative's limitations included: 'It is not easy to use'; 'there are unnecessary items'; 'it makes everything difficult to use in English'; and it 'allows only one free class.'

Student Views on Use of Quizlet

Table 5 displays analysis of student opinions on the use of Quizlet in social studies, according to Gagne's nine steps.

Table 5. Social Sciences Teacher Candidate/Student Views on the Use of Quizlet

	Gagne's Events	Student Statements (Quizlet)	n
1	**Gaining attention**	Fun Interesting	4 1
2	**Informing learners of objectives**	-	-
3	**Stimulating recall of prior knowledge**	-	-
4	**Presenting the content**	Different types of useful content presentation Beneficial for teaching terms and concepts	6 2
5	**Providing 'learning guidance'**	Can be used for overview of lesson	1
6	**Eliciting performance (practice)**	Provided being active in lectures Matching application useful for social studies Can be used for overview of lesson	1 1 1
7	**Providing feedback**	-	-
8	**Assessing performance**	Can be used for giving homework	1
9	**Enhancing retention and transfer**	Provided retention	4

Notably, 'different types of content presentation are useful' (6), 'fun' (4), and 'retention' (4) received more comments than the other steps/themes, but as Table 5 shows, some themes received no comments. Eight student statements referred to *presenting the content*, five to *gaining attention*, four to *enhancing retention and transfer*, three to *eliciting performance*, and one each to *providing learning guidance* and *assessing performance*. Some examples of student statements follow:

- *Features like description and explanation, spelling and matching increase activeness in a lesson.*
- *Increased interest in the course because the tool changes prepared questions into other question types*
- *A handy application for subjects that need to be memorized in social studies lessons. The practice of pairing helps while matching literature with writers and wars with dates in history courses.*

However, seven students emphasized that Quizlet is more suitable to foreign language teaching. Furthermore, it cannot be used in every environment because it requires a technological device.

Student Views on Use of FlipQuiz

Table 6 displays analysis of student opinions on the use of Quizlet in social studies, according to Gagne's nine steps.

Table 6. Social Studies Teacher Candidate/Student Views on the Use of FlipQuiz

	Gagne's Events	Student Statements (FlipQuiz)	n
1	**Gaining attention**	Fun Attractive Motivating	5 1 1
2	**Informing learners of objectives**	-	-
3	**Stimulating recall of prior knowledge**	-	-
4	**Presenting the content**	Instructive Provides discussion environment (increases knowledge)	1 1
5	**Providing 'learning guidance'**	Group participation and discussion	10
6	**Eliciting performance (practice)**	-	-
7	**Providing feedback**	-	-
8	**Assessing performance**	Challenging environment Well scored system Competition format (knowledge competition)	8 2 2
9	**Enhancing retention and transfer**	Provides retention	3

Notably, 'group participation' (10), 'challenging environment' (8), and 'fun' (5) received more comments than the other steps/themes, but as Table 6 shows, some themes received no comments. Twelve student statements referred to *assessing performance*, ten to *providing learning guidance*, seven to *gaining attention*, three to *enhancing retention and transfer*, and two to *presenting the content*. Some examples of student statements follow:

- *Being used in a group makes [FlipQuiz] fun.*
- *When we discuss questions asked in the group environment, our knowledge increases.*
- *Sharing our views with friends on the team helped us learn what we do not know.*

Moreover, 10 students expressed the importance of group work, and none specified any limitations of FlipQuiz.

DISCUSSION AND CONCLUSION

Students' opinions of five IRSs found the tools generally suitable for use in social studies. When Gagne's nine steps were considered, results differed according to each of the IRSs.

According to teacher candidates' views on Kahoot, it mostly contributes to *gaining attention*, *assessing performance*, and *enhancing retention and transfer*; next to *presenting the content*, *eliciting performance*, and *providing feedback*. Although no students commented thusly, Kahoot was actually usable in *providing learning guidance*, for instance, providing personalized use and preventing students' disconnection. This result follows that of Damick (2015), who stated that Kahoot is a good review tool to keep students focused on instruction. Dellos (2015) found that Kahoot created a fun, competitive environment that encouraged learning and that educators could use to evaluate students. Furthermore, according to Plump and LaRosa (2017) Kahoot attracted even the most introverted students by gamifiying learning and thereby increasing students' classroom participation. Similarly, in Damick's (2015) report a geometry teacher stated that Poll Everywhere tool (another IRS) required mobile devices for all students and it was not possible for each classroom. Hung (2017) declared that teachers using Kahoot need a Plan B (such as lending mobile devices to students) because of formal and technical problems related to 'bring your own device' (BYOD) policy. In addition, the character limitation for questions might lead to difficulties when, for instance, history lessons require long questions. Martins et. al.(2019) used Kahoot with high school students and they observed an improvement in students' learning.

According to findings, Plickers can contribute most to *gaining attention*, *assessing performance*, and *enhancing retention and transfer*. Although students did not comment on several instructional steps, considering general positive comments about students' active participation in physical and mental activities, Plickers is also usable for *eliciting performance*. In Wood, Brown, and Grayson's study (2017), the vast majority of students reported that Plickers encouraged active participation and that Plickers's tests encouraged learning. Its most notable feature, moreover, is participating without technology (e.g., Wi-Fi connection, computer, mobile device), like Krause, O'Neil, and Dauenhauer (2017) stated. Therefore, Plickers can be more useful than other tools in planning both verbal and classroom lessons that are less likely to have access to technological devices. Krause et al. (2017) also mentioned that although most students today own mobile phones, their usage is prohibited in some schools, and devices could be damaged in lessons like physical education. In the same study, it was stated that some courses needed applications that were time- and cost-saving, with a minimum of technology. Although the time spent while reading QR code cards in Plickers was specified as a negative feature, if we consider traditional distribution, implementation, collection, reading, evaluation, and individual feedback for standard multiple-choice tests, clearly, an interactive response system shortens the process. Shana and Abd Al Baki (2020) used Plickers in formative assessment process of students and they observed that Plickers App had a greater positive impact on students than revision sheet. This finding supports the Plickers' use in *assessing performanc*e step of 9 events.

According to students' opinions, Socrative can contribute most to *gaining attention* and *presenting the content*. In support of this result, Dervan (2014) stated that systems such as Socrative developed engagement throughout the lesson made the lesson more interactive, and helped students understand the course material. In the current study, students' lack of comments on *informing learners of objectives*, *stimulating recall of prior knowledge*, *providing learning guidance*, *eliciting performance*, and *assessing performance* might relate to Socrative's negative aspects. Dervan (2014) stated that Socrative is not very powerful in helping teachers when students have difficulties understanding. This explanation supports the result that

Socrative is weak in *providing learning guidance* and *evaluating performance*. However, Dervan's same study stated that Socrative allows students and teachers to understand fully any deficiency in knowledge and concepts. Considering this statement, it seems that, despite our study's results, Socrative can be used in *evaluating performance*. Additionally, teacher candidates disliked that Socrative was difficult to use (partly because of its English interface), had unnecessary items, and allowed opening only one free class. Mendez and Slisko (2013) stated that this technology was of interest in the class parallel to this study; but in contrast with this study, they reported that students generally found use of the tool easy. In Dervan's (2014) study, the vast majority of students stated that using Socrative was easy. In our study, students might have evaluated its use as difficult because they do not know English. Moreover, Dervan's (2014) study found that Socrative does not allow more than 20 teams to log in at the same time and that each activity can have only 50 users. This statement supported the result of the study as explained above.

Similar to Socrative, students saw Quizlet as contributing the most to *gaining attention* and *presenting the content*. Students emphasized that Quizlet can be used in six of Gagne's nine steps, except *informing learners of objectives*, *stimulating recall of prior knowledge*, and *providing feedback*. Vargas (2011) observed that Quizlet might provide some students with the needed motivation to continue learning vocabulary. Similarly, Lander (2015) found that in the Quizlet environment, students were motivated by controlling their peers' words and that they also worked collectively and collaboratively by monitoring their progress. Motivation corresponds to *gaining attention (Ference & Vockell, 1994)*. Moreover, Quizlet can serve in to *present the content.* Because it provides the opportunity to create flashcards. Tests (fill-in-the-blank, multiple choice, and true-false) are automatically generated in the Quizlet test page via terms from flashcards (Crandell, 2017). Thus, Quizlet can be used to *elicit* and *assess performance*. Moreover, students can play games that help them practice with flashcard sets (Crandell, 2017), and this feature might help educators *enhance retention and transfer*. In addition, teacher candidates emphasized that Quizlet is more suited to foreign language teaching. As Lander (2015) observed, Quizlet's digital flashcard application is redefining vocabulary learning. As Crandell (2017) also observed, even though it was not specially prepared for learning languages Quizlet has many features that make it suitable for language teaching. In addition, Quizlet can be used in concept teaching, thanks to its matching application. In this study, students found that, like Kahoot, Quizlet's need for a technological device was a limitation.

According to the students, FlipQuiz can contribute most to *assessing performance*, *providing learning guidance* and *gaining attention*. Gündüz and Akkoyunlu (2019) created a flipped learning environment in higher education and used FlipQuiz as a tool for test questions. They found that flipped learning environment give students an opportunity to experience more instructional flexibility during classes both online and in-class. Tucker (2015) stated that it presented a fun way for students to review for a midterm or final examination. Therefore, FlipQuiz can be appropriate for *gaining attention* and *eliciting performance*. Moreover, FlipQuiz can be appropriate for *assessing performance* because it was defined as a test and quiz creating tool (Sağlam, 2018). Teacher candidates had no comments on *informing learners of objectives*, *stimulating recall of prior knowledge*, and *providing feedback*, but also they cited no limitations. Considering that it allows teachers to create a competition for answering questions as a group, FlipQuiz is appropriate for *eliciting performance*. In the same way, it can be interpreted that giving the answers and discussing them as a group can also be used for *providing feedback*.

In conclusion, Kahoot and Plickers can be used for the steps of *gaining attention*, *assessing performance*, and *enhancing retention and transfer*; Socrative and Quizlet tools can be used for *gaining attention* and *presenting the content*, and FlipQuiz can be used for *gaining attention*, *providing learning guidance*, and *assessing performance*, according to social sciences education teacher candidates. These results show that *gaining attention* was emphasized for all tools. Clearly, the gaining attention feature, the

most highlighted in the literature, was also emphasized in this study. Wang (2017) supports this finding by stating that IRS is a useful learning tool for keeping students awake and focused on instruction throughout the lesson. Datta, Datta, and Venkatesh (2015) also suggested the use of technology-based interactive teaching techniques to make courses more interesting and attractive in undergraduate medical education. Another important result is that, in social studies, the use of Kahoot, Plickers, and FlipQuiz is appropriate for *assessing performance*. Hung (2017) suggested that educators should use the Clicker technique as a stimulus to assess students' comprehension levels, to provide immediate, adaptable feedback to their answers to questions.

In addition, other results were that Plickers could be used in *eliciting performance*, Socrative in *presenting the content*, and Quizlet in *presenting the content*, *eliciting performance*, and *assessing performance*. At the same time, some negative aspects of the IRSs were emphasized. Kahoot is unsuitable for long questions, and it is sometimes difficult to use because students might not own suitable technological devices. One remarkable result for Socrative was that for groups who do not know English, its use is difficult because the interface is in English. Moreover, in general, limitations on the application's free version have been criticized by users. Quizlet was evaluated as nonfunctional for some groups because, like Kahoot, it requires a personal device with an Internet connection. Another important result is that, because of its types of activities, Quizlet is especially appropriate for language and concept learning.

Suggestions

- This study has revealed social studies teacher candidates' opinions of five different IRSs according to Gagne's nine instructional steps. These results can be compared, supported, or generalized with quantitative studies conducted with similar groups. Additional qualitative and quantitative studies with specialist teachers in social sciences will provide different perspectives. Because this study was limited to five IRSs, researchers suggest assessing other IRSs according to Gagne's nine steps, with various types of social studies.
- Because participants were social sciences teacher candidates, this study was limited to the social studies area. For this reason, specific interpretations of results covered sub-domains such as history and geography. Similar studies can also be conducted in areas with very different characteristics, such as mathematics, science, and language education; how the use of IRSs differs according to an area can then be determined. Qualitative and quantitative studies conducted with both students and teachers can contribute to the literature. Finally, achieving generalizable results with in-depth qualitative studies can provide a theoretical background.

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