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Utilising interactive applications as educational tools in higher education: Perspectives from teachers and students, and an analysis of academic outcomes

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ABSTRACT

Our students belong to a highly digitised generation with easy and rapid access to information. They are dependent on technology and tend to become bored quickly. There is an ongoing debate regarding the need to reconsider our teaching methods in order to capture the attention of our students. This study surveyed both students and teachers on the subject of online teaching and its impact on university education. Additionally, it explored issues related to integrating interactive applications in education. These applications are considered essential tools in combating student boredom and disinterest. They also enable teachers to receive valuable feedback, which was highlighted as critically important by educators in the survey.

In this context, we conducted a study within a chemical engineering program at a Spanish university. We examined the use of four different interactive applications (Kahoot!, Wooclap, Classflow, Moodle) and compared the results with those from previous years when only one of these applications was employed. This study aimed to determine how using multiple applications led to increased student participation, driven by avoiding monotony, resulting in improved academic performance.

1. Introduction

University professors in the present face the challenge of captivating a student population that differs significantly from previous generations. Our most recent group, Generation Z, born in the 2000s, has come of age in an era defined by widespread global connectivity through social networks. They view constant access to information and continual connection with others as the standard (Miller and Mills, 2019).

The reliance on technology within this generation is striking; they employ it as their primary tool for accessing information, communicating with peers, sharing ideas, creating content, and expanding their knowledge (Miller and Mills, 2019). Notably, Generation Z demonstrates a higher level of proficiency with mobile technology and a greater inclination toward self-directed learning compared to their predecessors, the Millennials. However, it's important to acknowledge that this increased reliance on technology can sometimes coincide with a deficiency in critical thinking skills (Giray, 2022).

Students from Generation Z often describe themselves as feeling bored and distracted when not simultaneously engaging with multiple sources of information. Their attention spans are notably shorter than those of Millennials, and they possess an even greater appetite for immediate answers and information (Shatto and Erwin, 2016). Nevertheless, this new generation of "digital natives" actively seeks to participate in the learning process (Giray, 2022).

To sum up, today's university professors are grappling with the unique characteristics of Generation Z, who have grown up in a digitally connected world where instant access to information is the norm. While they exhibit impressive tech-savviness and self-driven learning, there is also a need to foster critical thinking skills in this generation. Professors must adapt their teaching methods to effectively engage and educate these "digital natives".

Students today have at their disposal handy and powerful tools such as smartphones, tablets, and laptops (Green et al., 2021). These devices hold the potential to facilitate the integration of interactive applications

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in university teaching. However, traditional lectures and masterclasses continue to dominate in-person teaching, and many educators are not fully prepared for online instruction (Martín-Sómer et al., 2021; Romero et al., 2021).

In recent years, due to the typical passivity observed in some students during theory-based classes, there has been a noticeable increase in the use of interactive educational tools in university teaching. These tools foster improved interaction between teachers and students (Besalti and Satici, 2022). The results have indicated positive student engagement attitudes and behaviors toward learning (Hughes et al., 2020). One frequently employed application in university courses is Kahoot!, with literature reporting enhanced academic outcomes (Aras and Çiftçi, 2021; Martín-Sómer et al., 2021; Orhan Göksün and Gürsoy, 2019; Öz and Ordu, 2021; Sumanasekera et al., 2020; Wang and Tahir, 2020). Other less-evaluated applications include Moodle (Costello, 2013; Nkomo and Nat, 2021; Romero et al., 2021), Quizizz (Orhan Göksün and Gürsoy, 2019), and Socrative (Romero et al., 2021).

Furthermore, incorporating these tools into teaching aligns with the technological reality of today's students, fostering their participation in the subject matter (Gilboy et al., 2015; Romero et al., 2019). Interactive applications can also provide significant support for traditional teaching, especially when they are freely accessible, thereby enhancing their impact on learning outcomes. As a result, both face-to-face and e-learning methods have gained popularity worldwide in the past decade (Joy and Pillai, 2021).

Among these interactive applications, Kahoot! is a game-based learning platform used for formative assessment or as a break from traditional classroom activities (Wang and Tahir, 2020). Quizizz allows the creation of gamified quizzes and interactive lessons to engage learners (Orhan Göksün and Gürsoy, 2019). Socrative offers an interactive environment for students and teachers to share their learning experiences (Romero et al., 2021). Lastly, Moodle is the world's most popular e-learning platform, enabling teachers to share lectures and conduct self-assessment tests and quizzes (Costello, 2013; Romero et al., 2021).

Numerous studies have investigated the use of interactive tools in educational settings, consistently demonstrating positive learning effects (Adedoyin and Soykan, 2020; Ghasem and Ghannam, 2021). However, there is a lack of prior research on the utilisation of Classflow and Wooclap tools in both online and face-to-face teaching. Furthermore, as far as we are aware, no studies have explored the perspectives of these tools in the context of online learning versus face-to-face instruction.

Building upon the previously mentioned studies, this research investigated the utilisation of various interactive tools, specifically ClassFlow, Moodle, Wooclap, and Kahoot!, with the aim of increasing student involvement in both online and traditional face-to-face instruction within an engineering course at a Spanish university.

The findings revealed a higher rate of academic success compared to previous courses where solely the Moodle application was employed. Additionally, surveys were conducted to gain insights into the perspectives and preferences of both students and teachers regarding the utility of interactive tools and their perceptions of online versus face-to-face instruction.

This study suggests the potential for harnessing the benefits of interactive applications for sustained integration in educational settings.

2. Methods

2.1. Interactive applications

Different interactive applications were utilised as a regular quiz system during both theoretical and practical engineering classes. These applications were employed in various teaching formats, including online, hybrid, and face-to-face classes.

Classflow (https://classflow.com/en-gb/) is a free cloud-based application that is compatible with all devices and operating systems. Teachers can use it to poll the entire class, instantly viewing students' responses. They can also send tailored, levelled assessments to students, allowing them to work through these assessments at their own pace. Additionally, teachers have access to the Assignment Tracker feature, enabling them to monitor individual students' progress by accessing real-time metrics on the status of pending assessments and assignments.

Wooclap (https://www.wooclap.com/) is a free interactive platform designed to enhance class interactions and assess students' understanding using their smartphones. It captures students' attention, encouraging them to participate more actively. Moreover, it allows continuous monitoring of student understanding, provides feedback, and reinforces learning.

Moodle (https://moodle.org/) is a free learning management system written in PHP and distributed under the GNU General Public License. It has been developed based on pedagogical principles for various educational approaches, including blended learning, distance education, flipped classrooms, and other e-learning projects in schools and universities (Costello, 2013; Romero et al., 2021).

Kahoot! (https://kahoot.com/) is a game-based learning platform widely used as an educational technology for university subjects (Aras and Çiftçi, 2021; Martín-Sómer et al., 2021; Orhan Göksün and Gürsoy, 2019; Öz and Ordu, 2021; Sumanasekera et al., 2020; Wang and Tahir, 2020). Its learning games consist of user-generated multiple-choice quizzes accessible via a web browser or the Kahoot app.

2.2. Participants

The study was conducted during three academic courses (2019–20, 2020–21 and 2021–22) in an engineering subject (Fluid Mechanics) belonging to the Chemical and Environmental Engineering Group at Rey Juan Carlos University (Madrid, Spain), which is a mandatory subject of the last course of the degree. The total of enrolled students in the three academic courses was approximately 350. Two full professors from the Chemical and Environmental Engineering Group taught the subject over three academic years. The distribution of the subject matter was equitable for both instructors. Since the sample size is moderate, the results should be cautiously handled. However, the authors believe these results are representative and may be a starting point for future online classes or studies. The subjects' study plan comprises six lessons, including theory and practice (exercises to theory application). The six lessons are grouped into two blocks (homogeneous in extension and difficulty).

Every student actively participated in both segments of the study. During the 2019–20 academic year coinciding with the Covid-19 pandemic, the lectures were conducted online through the Microsoft Teams platform (Pal and Vanijja in, 2020). However, the classes adopted various formats in the subsequent two academic years covered by this study (2020–21 and 2021–22). Concretely, a hybrid approach was adopted in the 2020–21 academic year, while traditional face-to-face format was employed in the 2021–22 academic year. When a new topic was finished, the interactive applications were used in the last minutes of each class to review the lesson taught and evaluate the student's learning achievements. Throughout the 2019–20 academic year, Moodle application was exclusively utilised at the end of each of the six lessons within the two blocks comprising the subject,one questionnaire per lesson, while in the academic years 2020–21 and 2021–22 academic years were included all the interactive applications. Specifically in Block I, Classflow, and Kahoot! tools were employed in both theory and practical quizzes. In the case of Block II, the selected applications were Wooclap and Moodle (one quiz per lesson). The students' participation was provided in all the activities from the application itself, being close to 80 % of the total. The use of the camera by the students was not required because Rey Juan Carlos University has not regulated its use.

On the other hand, to know teachers' points of view, the study included 40 teachers appointed to the Department of Chemical and Environmental Technology. They give lectures in other subjects of

Table 1
Example of some questions of Moodle quiz used in Block II, lesson 5. Right answers are underlined for T/F and quiz-type questions.

No.	Question	Type	Answer
1	Water at 20 ºC flows through a 12.7 mm diameter and 18.3 m length pipe with a flow rate of 18.95 l/min. At which pipe length (m) the fully developed flow is reached?	Short answer	0.314 m
2	The entrance length is affected by the viscosity of the fluid?	Quiz type	a) Higher viscosity, shorter entrance length b) Entrance length is not dependent on the fluid's viscosity. c) Entrance length just depends on fluid velocity. d) None of the previous is right.
3	When the entrance length is reached, the fluid flow is fully developed, and its velocity changes only with distance along the pipe.	T/F type	a) True b) False

Engineering degrees during the 2019–20, 2020–21 and 2021–22 academic years. In addition, all of them employed some interactive applications for their classes.

To enhance the utilisation and assessment of interactive applications, teachers furnished students with electronic information about each tool and delivered explanations before deployment. Furthermore, to encourage greater student involvement and engagement, an additional 0.1 points were awarded to the final subject grade of the student who secured the top position in the quiz rankings (the subject uses a grading scale ranging from 0 to 10). With the Moodle tool, there were a total of 10 questions, including multiple-choice questions (with 4 options, of which only one was correct), true or false questions, and short-answer questions, with maximum response times of 30, 60, and 180 s, respectively. In the case of the Kahoot and Wooclap applications, 10 questions were also used, combining multiple-choice and true or false questions with response times of 60 and 30 s, respectively, as short-answer questions were not allowed. On the other hand, Classflow was utilised as an interactive whiteboard where students could provide numerical answers for problem-solving and text-based responses for theoretical questions.

The questions were based on the slides explained in the teaching sessions, similar to the final exam described in previous work (Martín-Sómer et al., 2021). An example of the type of questions used in each of the applications is shown in Table 1. Based on the study's purpose of comparing teachers' and students' opinions, two experimental groups were organised: students and professors. Each of these students actively engaged with the interactive applications, and the academic outcomes achieved in the online format during the 2019–20 academic year were compared with those from the hybrid format in 2020–21 and the face-to-face format in 2021–22.

2.3. Surveys and data collection of academic results

The survey was conducted using an online questionnaire meticulously designed to gather data effectively. Furthermore, the questionnaire was easily accessible on various devices, and to encourage broader participation, it remained open for three weeks. During this period, a comprehensive set of questions was posed to both teachers and students. These questions were administered using Google Forms and were strategically crafted to gauge their perspectives on the positive and negative impacts of employing interactive applications in learning, social

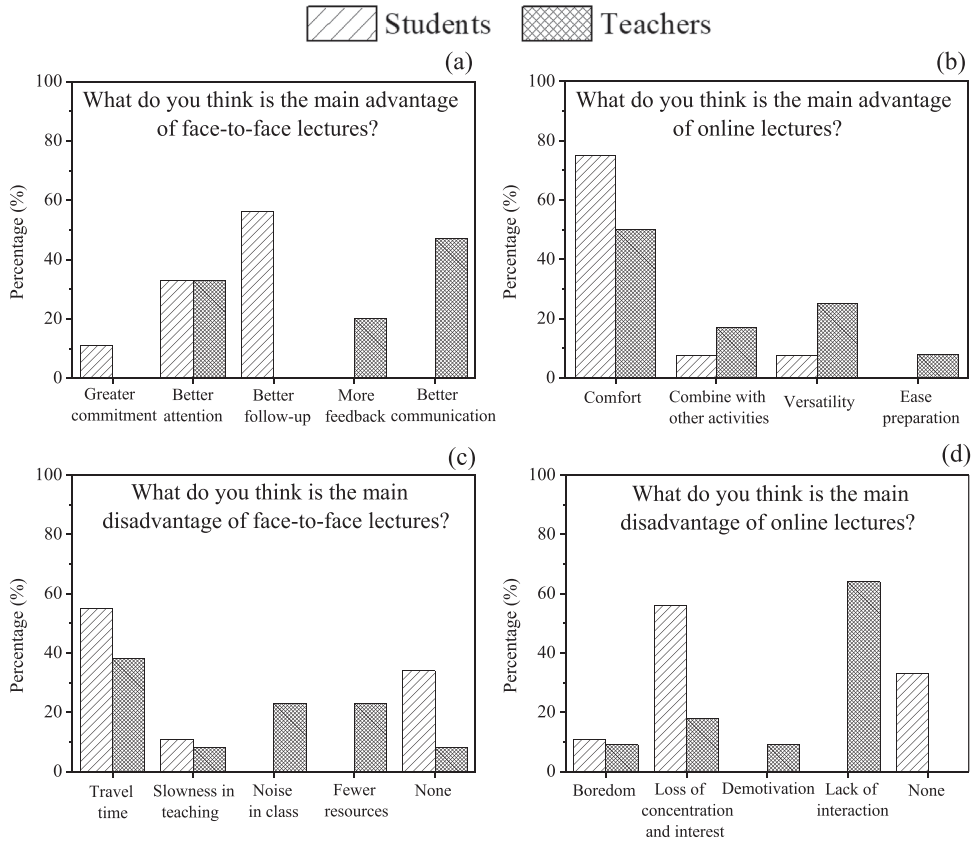

Fig. 1. Main advantages and disadvantages indicated by students and teachers of the online and face-to-face education models.

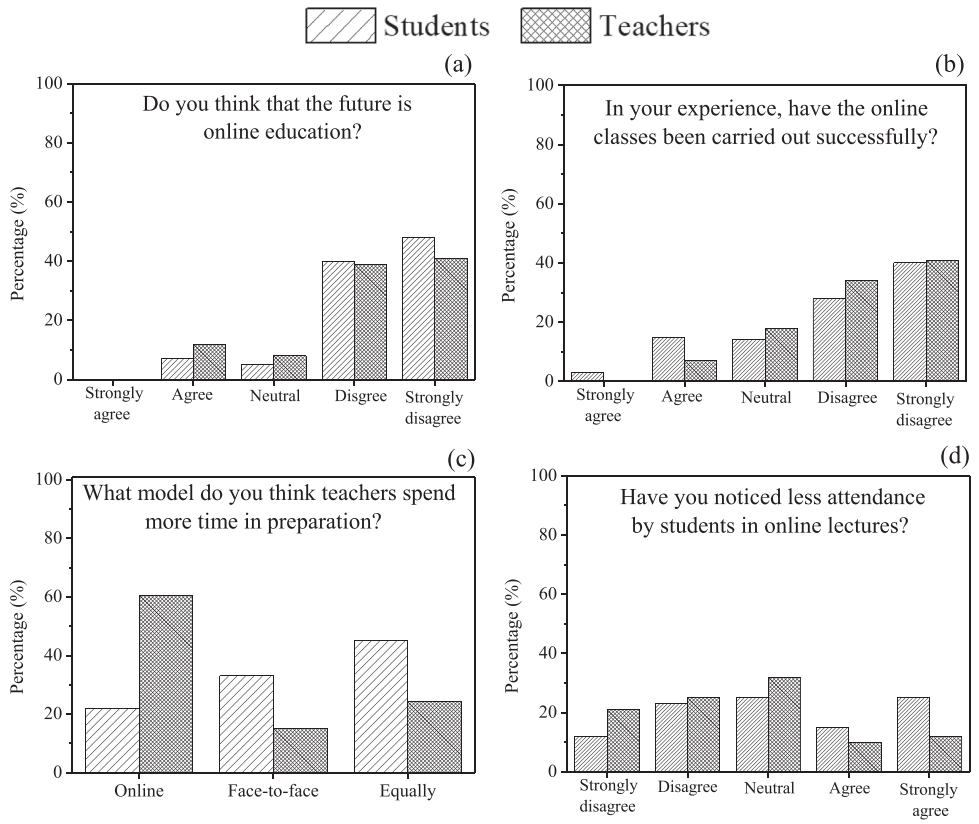

Fig. 2. Opinion of students and teachers about the online class model.

interaction, learner-teacher engagement, advantages/disadvantages associated with online classes, and their preferences for face-to-face or online lectures. Specifically, the questions included in the interviews were as follows:

1. What do you think is the main advantage of face-to-face/online lectures?
2. What do you think is the main disadvantage of face-to-face/online lectures?
3. Do you think that the future is online education?
4. In your experience, have the online classes been carried out successfully?
5. What model do you think teachers spend more time in lectures preparation?
6. Have you noticed less attendance by students in online lectures?
7. What type of teaching model do you prefer?
8. With which model do you think the student has a greater concentration?
9. Do you think that university is also important for social interaction?
10. Do you think the same social interaction could be achieved online?
11. Have you used an interactive tool in online lectures?
12. Do you think interactive applications helped to keep the interest?
13. Would you recommend using interactive tools in online/face-to-face lectures?
14. Which interactive application do you prefer for theory lectures?
15. Which interactive application do you prefer for face-to-face lectures?
16. If you had to choose only one interactive application, what would it be?
17. Do you think it is better to use a single interactive application or several?

It is necessary to note that the results obtained in this work can be used as a global approximation. The moderate sample size and the fact that the people surveyed come only from the branch of engineering knowledge could mean that the conclusions obtained were not fully applicable to all areas of education.

On the other hand, to assess the role of interactive applications in student learning outcomes, the academic results of three courses were compared: 2019–20, where only Moodle was used, and classes were conducted in an online format; 2020–21 with hybrid classes where all four interactive applications were used; and 2021–22 with face-to-face teaching, also employing all the applications. The course grade is on a scale from 0 to 10, and a score below 5 involves the student not passing the subject. The final mark is built based on the following educational activities: final exam (50 %), seminars (20 %), laboratory practices (20 %), and group work (10 %).

3. Findings

3.1. Surveys about online vs face-to-face education

During the course of this study, both students and teachers were queried about various aspects pertaining to both face-to-face and online education. Fig. 1 illustrates the responses gathered regarding the primary advantages and disadvantages associated with these educational models. According to students, the foremost advantage of face-to-face classes is the enhanced ability to stay on track, as depicted in Fig. 1a. In contrast, teachers emphasised improved communication as the most significant benefit.

Interestingly, this aligns with the drawbacks identified in online classes (Fig. 1d), where students indicated a noticeable decline in attention and interest. This decline could be attributed, among other factors, to the boredom resulting from a lack of interaction. Furthermore, teachers in the online model identified this absence of interaction

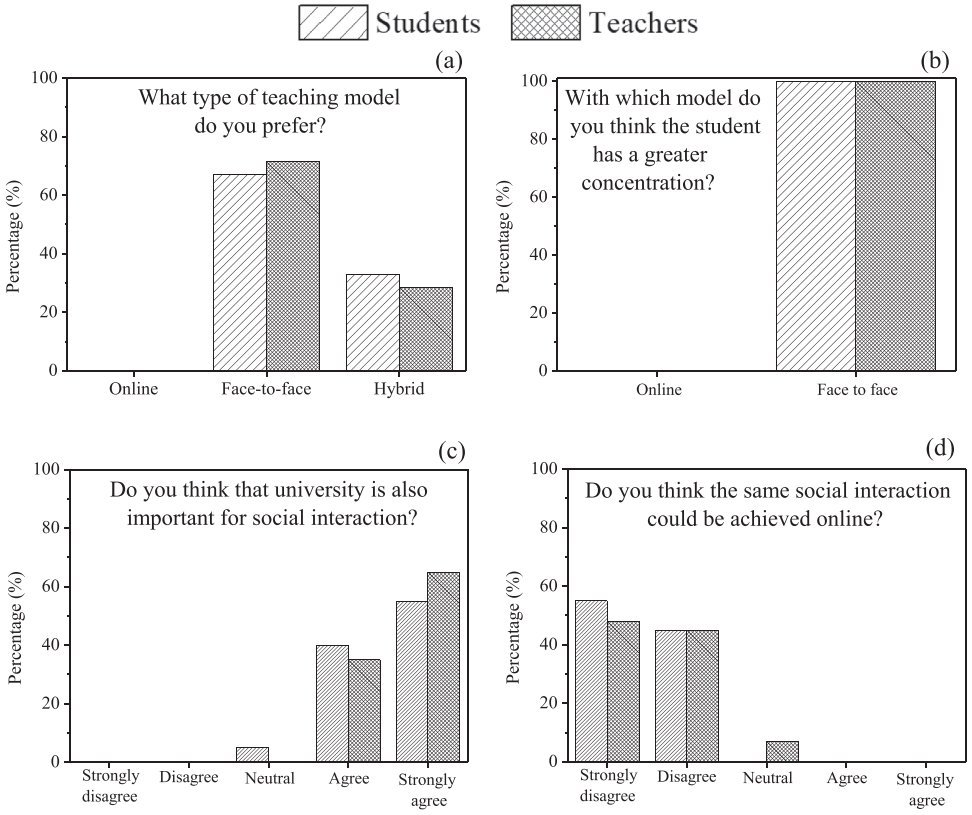

Fig. 3. Opinion of students and teachers about the online and face-to-face models.

as the most prominent challenge. It impedes their ability to gauge students' progress and receive valuable feedback. Regarding the advantages of the online model (as depicted in Fig. 1b), both teachers and students identified the primary benefit as greater convenience, stemming from the ability to attend online classes without the need for travel. Additionally, as highlighted in Fig. 1c, teachers noted that conducting online classes allows for the utilisation of a wider range of resources, which, in turn, benefits student learning. Similar advantages have been reported in other studies found in the literature (Hofer et al., 2021).

On the other hand, Fig. 2 shows the responses obtained by students and teachers concerning aspects related to online education. Specifically, Fig. 2a shows that most respondents think that education will continue to be face-to-face. This result is a remarkable aspect since the evolution of new technologies has caused a progressive increase in recent years in online education courses, a fact that seems a priori to address society towards this type of educational system. However, it appears that most of those surveyed do not think this model could replace the face-to-face model in the future. It seems that neither the teachers nor the infrastructure were prepared for its implementation. Still, it is expected to be improved (Adedoyin and Soykan, 2020). Fig. 2b illustrates that a majority of both teachers and students hold the view that online classes have not been developed successfully, even though most teachers have invested a considerable amount of time in class preparation, as depicted in Fig. 2c. Additionally, the last question about the survey respondents' perception of the student's attendance in online lectures is shown in Fig. 2d. It can be observed how approximately half of students and teachers have noticed less attendance to classes by students, something undoubtedly associated with boredom and lack of interest, which is in agreement with the responses of the survey shown in Fig. 1d. This point of view has been verified through the log files provided by Microsoft Teams, in which there was lower assistance than that registered in face-to-face lectures.

When both students and teachers were asked about their preferred educational model, it is worth noting that none of the respondents chose an online model (as illustrated in Fig. 3a). The overwhelming majority, around 70 %, preferred the traditional face-to-face model. In contrast, 30 % indicated a preference for a hybrid model, which aligns with recommendations from other authors (Hergüner, 2021). This preference for traditional face-to-face instruction can be readily understood, especially when 100 % of the respondents indicated that they find it easier to concentrate in a face-to-face model (Fig. 3b).

Furthermore, all respondents emphasised the importance of social interaction in education (Fig. 3c). In their view, achieving meaningful social interaction is challenging in an online education model (Fig. 3d). Similar sentiments were echoed in a study of Selvaraj et al. (Selvaraj et al., 2021). It's important to acknowledge that the disadvantages highlighted in this and other studies could potentially diminish in an online class model with fewer students and a stronger emphasis on student-teacher interaction.

The preference for a hybrid educational model, as indicated by 30 % of the respondents, suggests that there are merits to this approach. Hybrid education offers a unique blend of the strengths of both traditional face-to-face and online learning methods. One significant advantage is flexibility. Students can benefit from the convenience of online resources and asynchronous learning while still enjoying valuable in-person interactions during scheduled sessions. This flexibility allows learners to adapt their study schedules to accommodate work or personal commitments, making education more accessible. Additionally, the hybrid model can promote self-directed learning as students must take responsibility for managing their time effectively in the online component. Furthermore, it aligns with the demands of the modern workforce, where digital skills and remote collaboration are increasingly vital. The hybrid model also offers educators opportunities to innovate in their teaching approaches, combining traditional pedagogy with technology-enhanced instruction. Overall, the preference for the hybrid model highlights its potential to provide a balanced, adaptable, and effective educational experience that meets the diverse needs of students and the evolving demands of the educational landscape.

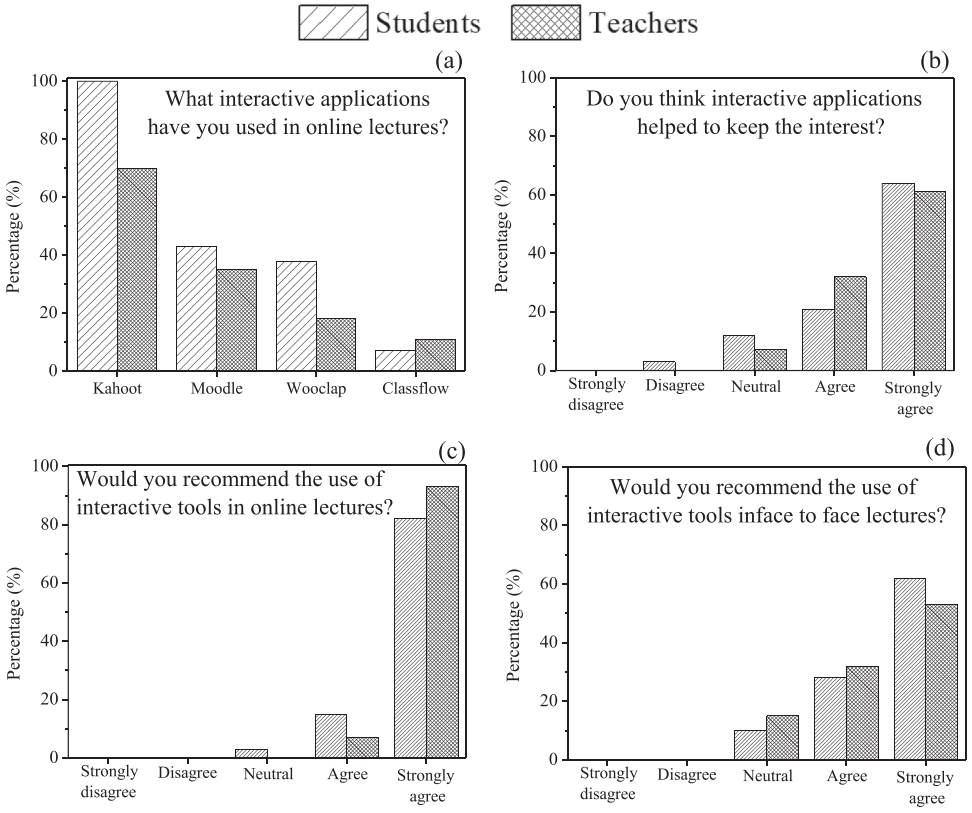

Fig. 4. Opinion of students and teachers about the use of interactive educational tools.

3.2. *Surveys about the use of interactive applications*

As observed in the previous section, the significant drawbacks of an online educational model are related to boredom, loss of interest, and poor concentration (Wang and Tahir, 2020). Additionally, teachers noted the lack of feedback from their students as a significant

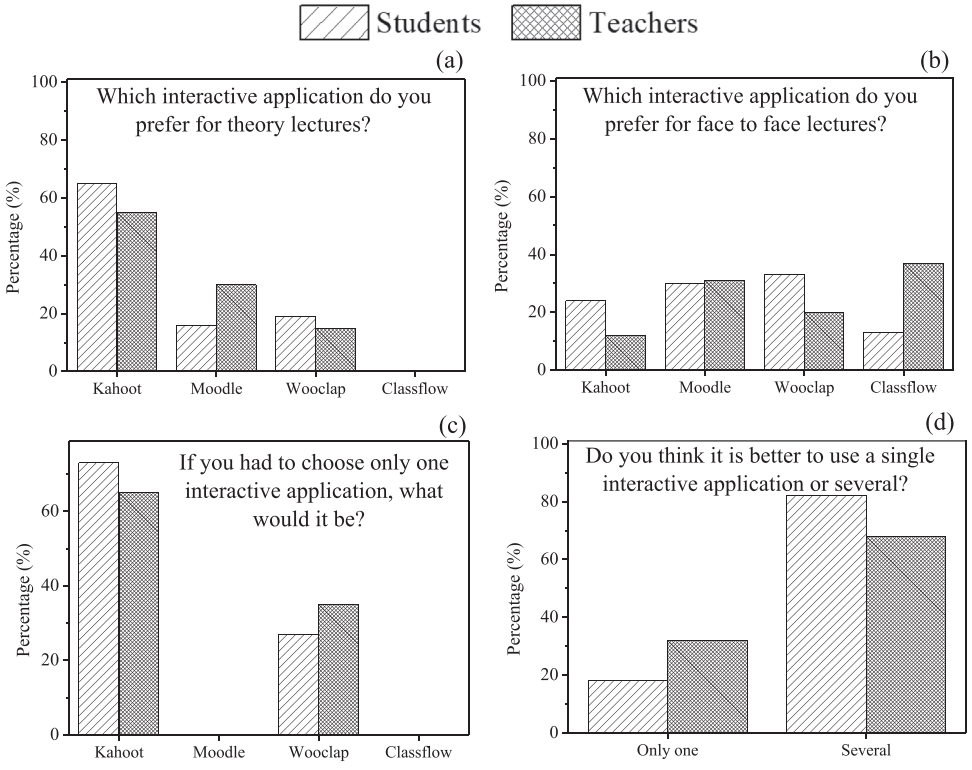

Fig. 5. Opinion of students and teachers about the use of interactive educational tools used.

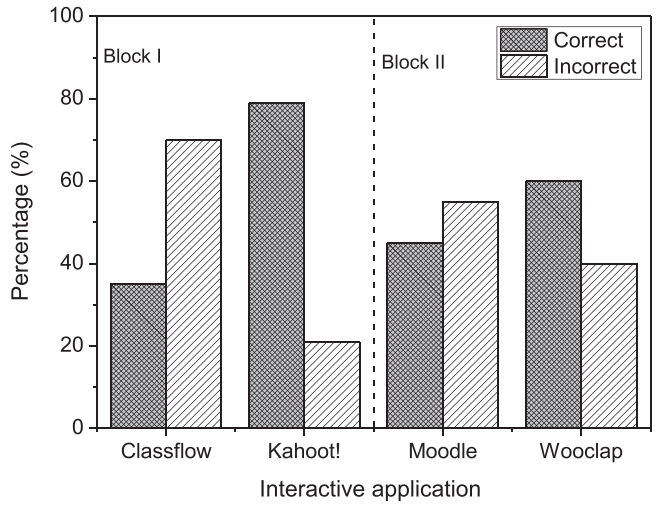

Fig. 6. Comparison of the percentage of correct and incorrect answers depending on the interactive application employed.

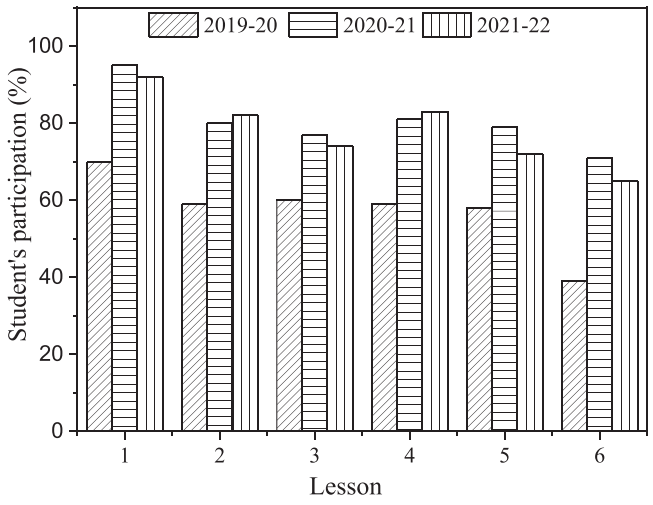

Fig. 7. Comparison of student participation in interactive activities carried out during this study.

disadvantage due to their limited knowledge of how the class unfolds. Prior research has demonstrated how the use of interactive applications can mitigate some of these issues by increasing student engagement, enhancing attention, and enabling teachers to identify areas where students may encounter learning difficulties (Martín-Sómer et al., 2021). Therefore, this section focuses on analysing the use of various interactive applications and determining which ones are more widely embraced by both students and teachers.

Fig. 4 presents the survey results concerning the opinions of students and teachers regarding the overall use of interactive applications. In Fig. 4a, we can observe the applications that respondents had prior experience with. Notably, all surveyed teachers and students had previously used an interactive application, with Kahoot! being the most popular choice, with 100 % and 70 % usage rates among students and teachers, respectively. Additionally, the utilisation of the Moodle application among teachers and students reached a high level, given its status as a direct tool provided by the university.

On the other hand, less frequently used applications for both teachers and students were Wooclap or Classflow, consistent with what's described in the literature as these tools are not commonly employed. However, the majority of respondents believe that using these tools helps increase interest during lectures (Fig. 4b), as observed in other studies (Lavoué et al., 2021). This effect may be attributed to improved interaction between teachers and students and the motivation stemming from the use of devices such as smartphones, tablets, and laptops, particularly the latter. Moreover, 100 % of the respondents recommend their use in online classes (Fig. 4c). However, not only that, but an impressive 90 % of both students and teachers would also recommend their use in face-to-face classes (Fig. 4d). These opinions may be linked to the gamified appearance of these interactive applications, providing entertainment for students while studying the subject matter.

Several interactive applications were used throughout the course to conduct this study. All of them were employed in various topics, encompassing both theoretical and practical components, to determine which one was considered the most effective for each type of teaching. Fig. 5a illustrates that Kahoot! is the favored application for both students and teachers during theoretical lectures. Kahoot! offers a quiz system resembling a game, which captures the participants' attention (Wang and Tahir, 2020). None of the other applications garnered preferences of more than 20 %, and it is particularly noteworthy that none of the respondents chose the Classflow application for this type of class.

Regarding the practical lectures, the survey results are displayed in Fig. 5b, where it can be observed that there is no preferred application as in the previous case. The preference for Kahoot! now diminishes significantly, as only a single final result could be considered for use in practical cases. It is important to highlight how Classflow, which allows students to present different results in real-time, is a good option for most teachers, although it does not stand out significantly from the rest of the applications (Fig. 5b). On the other hand, if it were decided to use a single interactive application in both theoretical and practical classes (Fig. 5c), about 70 % of teachers and students would choose Kahoot!, while the rest would opt for Wooclap. None of the respondents would select Moodle or Classflow as the sole application to use in the classes.

Moreover, it must be considered that most respondents would prefer to use more than one application, as it would enable them to leverage each one depending on the type of class being conducted (Fig. 5d).

3.3. Data analysis

The achievements of engineering students, depending on the interactive application used, were also assessed. Specifically, Fig. 6 compares the percentage of correct and incorrect answers for each application and course block. The best results were obtained when using Kahoot!, which aligns with the survey results shown in Fig. 5c, where both students and teachers preferred this application for theory lectures. On the other hand, the worst results were obtained with Classflow, which can be attributed to the fact that this application operates like a blackboard where open-answer questions are allowed, making it more challenging for students. However, the Moodle application exhibited better results even with various question types. This outcome may be related to students' familiarity with this tool because it has been used for several years. Lastly, Wooclap produced good results with a significant percentage of correct answers, but it has a drawback—it cannot be used for all types of questions, unlike Kahoot!.

On the other hand, Fig. 7 compares the participation in the training activities of academic year 2019–20, in which only Moodle was used, 2020–21 and 2021–22, in which three more interactive applications were implemented (Kahoot!, Wooclap and Classflow). In all courses, the highest participation was at the beginning and the lowest at the end of the subject, which is justified by the greater motivation at the beginning of the subject and the proximity to the final exams. In addition, in 2020–21 and 2021–22 courses, participation increased by more than 20 % in all subject lessons. This behaviour can be attributed to students prefer using several applications, as seen in Fig. 5d, related to a departure from monotony. Moreover, the students can take advantage of the features of each application for each type of class.

Finally, it is important to highlight that the increase in student participation in the activities carried out translated into a clear

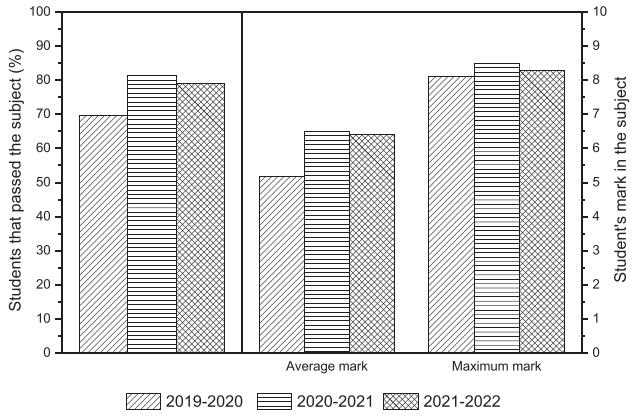

Fig. 8. Comparison of students' academic results obtained in courses 2019–20, 2020–21 and 2021–22.

improvement in the results obtained regarding the 2019–20 course, increasing both the pass rate and the average and maximum marks achieved in the subjects (Fig. 8). This relationship between the increase in participation and the improvement in the marks obtained was already observed in a previous study (Martín-Sómer et al., 2021), and it is essential to consider it to increase the success rate in university education. Furthermore, other authors observed similar results (Alsmadi et al., 2021; Harandi, 2015; Yekefallah et al., 2021), concluding that effective e-learning processes and their successful completion positively affect the outcomes of learners' satisfaction and their academic results. Therefore, the results of this study indicated that distance learning was effective in providing the required knowledge to the students (data from the 2019–20 course where only Moodle was used as an interactive application). However, the use of more learning tools (Kahoot!, Classflow, and Wooclap) improved academic results (data from the 2020–21 course with hybrid classes), and the combination of interactive applications and face-to-face classes resulted in the best marks of all courses evaluated in this study.

4. Conclusions

In this study, we presented the responses gathered from both teachers and students regarding their perspectives on online education and the use of interactive applications. While our sample size was moderate, the data indicates that a majority of respondents favor a traditional face-to-face teaching model that fosters greater interaction between students and teachers.

Respondents highlighted two major challenges with online education: boredom and a loss of interest. Conversely, they appreciated the convenience of accessing classes from anywhere and the time saved on commuting. Moreover, teachers emphasised the importance of receiving feedback from students to ensure effective course delivery. Interactive applications were positively received in this regard as they helped maintain student involvement and facilitated feedback.

Various interactive applications were employed in this study, and the findings suggest that the preference for a specific application depended on the lecture type and each application's unique features. However, in general, Kahoot! emerged as the favored application among respondents.

In conclusion, employing multiple interactive applications with diverse characteristics led to increased student participation. This likely stemmed from breaking the monotony associated with single-application use, resulting in notable improvements in student grades compared to the previous year when only one interactive application was used.

Finally, we compared the effectiveness of these tools by analysing the number of correct and incorrect answers provided by students across different subject blocks. Kahoot! stood out as the most effective application for achieving a higher number of correct responses, while Classflow led to more incorrect answers. When considering past academic years, our study demonstrates that incorporating multiple interactive applications into teaching enhances student engagement and improves academic performance, whether in e-learning or traditional face-to-face instruction.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request.

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