Received: 16 December 2022 | Revised: 22 May 2023 | Accepted: 10 July 2023

DOI: 10.1002/cae.22665

RESEARCH ARTICLE

WILEY

Virtual campus environments: A comparison between interactive H5P and traditional online activities in master teaching

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Abstract

Traditional face-to-face learning and teaching methodologies are currently being replaced or combined by virtual and digital campuses. In fact, a variety of online activities are available for virtual classrooms, becoming more interactive and creative teaching strategies. Among them, H5P is a free and open source platform that allows the creation of interactive content to be embedded in virtual campuses. This paper presents a comparison between traditional online and interactive H5P activities. The case study was carried out on the Wind Energy subject, within the MSc in Renewable Energies, assessing the impact on students and teachers through different indicators. The mean score of students who participated in the traditional online activity was 7.4/10, slightly lower than that of students who participated in the interactive H5P activity, which was 8.4/10. Actually, the statistical analysis showed that the proposed interactive H5P activity did not present a significant improvement on the average grade, in comparison to the traditional online activity. In terms of the students' perception, 75% found the interactive H5P activity easy to do, and 55% felt more motivated compared to traditional online activities. Moreover, teachers pointed out that the activity positively influenced students in terms of participation and motivation. These results confirm that the digital environment is here to stay, combined with other activities to fulfill all the skills and competences to be achieved.

KEYWORDS

e-learning, H5P, interactive activities, online learning, online teaching, virtual campus

Abbreviations: GC, general competences; ICT, information and communication technologies; LMS, learning management systems; SC, specific competences; TC, transversal competences; VC, virtual campus.

1 | INTRODUCTION

Nowadays, information and communication technologies (ICTs) are considered as necessary for mostly all day-to-day activities [2]. In fact, ICTs are currently used to chat with friends, date, play games, pay bills, organize meetings, plan trips, shopping ..., and even learn [1, 42]. In parallel, the convergence of education and digital technology has resulted in the emergence of intelligent educational systems, benefitting both students and educators. Leveraging digitalized educational services, the teaching and learning processes are conducted in a smart, efficient, and effective manner [12]. Over recent years, teaching has been continuously changing and evolving, in line with the quick use increase of ICTs [24]. Some of these novelties include gamification, which consists of the use of typical game mechanics and dynamics to increase the motivation, competitiveness, and effort of the students [14, 60]; and flipped classroom, where students learn specific topics at home, based on material created by the teacher, and use the face-to-face classes to carry out practical activities (labs, exercises, etc.) [22, 37, 44]. To support these novelties, several online platforms have recently appeared, such as Kahoot! [53], Socrative [47], Quizizz [39], and Genially [17]. Moreover, some authors consider that including ICTs into education is essential in the twenty-first century [9, 28].

Universities commonly use learning management systems (LMSs), virtual platforms containing all the necessary elements to implement technological modules and tools, enabling the teacher to manage and monitor students, upload documents, make tests, etc. [4, 10]. Nowadays, there are different LMSs in the market, both for free (Moodle, Claroline, ATutor ...) and through payment (Blackboard, WebCT ...). Among them, Moodle seems to be the most popular solution [7]. Moodle-based environments provide a virtual campus (VC) to support and provide the collaboration between teachers and students through messages, wikis, or forums [63]. Moreover, VCs can also be used to fulfill one of the main European Higher Education Area tasks [34]: changing from the traditional teacher-oriented approach to the learner-centered approaches, usually called 'active methodologies' [13], aiming to increase the students' participation in class [15].

According to Gamage et al. [16], Moodle offers a comprehensive range of 1753 plug-ins, which effectively augment the functionality of the platform in areas such as administration, assessment, collaboration, communication, content, and user interface enhancements. Analyzing the Moodle statistics, it becomes evident that communication and content plug-ins, including Moove, BigblackBN, Adaptable, H5P, and Eguru, garnered the highest number of downloads, indicating their popularity among users [38]. From these plug-ins, Jacob et al. [20] affirmed that the incorporation of interactive H5P resources within online educational courses has the potential to foster heightened levels of student engagement. Other authors have also emphasized that H5P has emerged as a pioneering solution for addressing technological and educational challenges [26]. It empowers instructional faculty to design interactive learning experiences by leveraging freely available open-source resources, while also facilitating knowledge exchange and learner engagement through a diverse range of interactive and mobile-friendly learning tools crafted, shared, and reused by educators [40, 57]. H5P©, that stands for HTML5 Package, is an open-source tool to create interactive, creative, and mobile-friendly contents [46]. As was previously described, H5P can be easily integrated in LMS [45], and it is already integrated in Moodle [3]. There are more than 50 types of interactive contents in H5P, such as `Agamoto`, `Column`, `Questionnaire`, and `Time-Line`, as detailed in https://h5p.org/. During the last few years, several studies have focused on using the H5P tool to carry out innovative activities at the university level and for asynchronous distance learning environments [35]. In Casan-Nunez et al.[6], seven activities based on five different types of H5P were developed for the preservice training program for secondary teachers to analyze the perception of the students regarding such activities. The authors concluded that the students rated H5P as a good tool to enhance the motivation and attention, mainly due to the variety of possible activities inside one application. Similar results were derived from the study carried out with business students [27], who highlighted some aspects such as interactivity or visual components (images, audio, and video). Indeed, the utilization of enriched interactive video as a pedagogical tool for instructional and learning endeavors based on H5P can be found in different contributions [5, 30]. The use of H5P to analyze its adequacy to self-directed and guided learning was carried out in Rekhari and Sinnayah [41] with anatomy and physiology students. Students considered that H5P activities were really helpful to improve their knowledge, just after assisting to the face-to-face lectures. Moreover, the authors of the study concluded that H5P can be helpful to teach to students with diverse backgrounds, motivation, and destinations. Wicaksono et al. [55] concluded that by using H5P in teaching English had an important effect on the students' motivation, and thus, influencing on the success of their English skills' development. A different study focused on analyzing the cost-effectiveness of modifying already existing videos through H5P, converting them into online content to carry out flipped-classrooms [54]. By considering the specific literature, a relevant number of papers can be found aimed to implement and evaluate H5P online interactive activities [45, 50, 56]. The evaluation of student satisfaction have been also conducted by considering H5P online learning experience [8, 21, 32]. However, there is a lack of contributions

comparing traditional and interactive online activities. Moreover, it would be desirable to compare 1.0 and 2.0 web tools in the context of VCs, evaluating the effects of these 2.0 interactive tools on the development of twenty-first-century learning skills. With this aim, this paper describes and discusses a comparison between a traditional online activity and an H5P interactive online activity developed with H5P integrated into a Moodle platform. The impact on both students and teachers is evaluated, considering quantitative indicators (such as participation, motivation, and student results) as well as the perception of students and teachers facing both online resources. Results corresponding to a case study carried out in the Wind Energy subject, within the MSc in Renewable Energies, are included as well.

The rest of the paper is structured as follows: Section 2 describes the methodology used; the case study is presented in Section 3; the different results are detailed in Section 4; and finally, Section 5 gives the conclusion of the work.

2 | METHODS

Figure 1 shows an overview of the proposed methodology consisting of three stages: data collection, activity design, and analysis of results.

2.1 | Data collection

In this first stage, all the information regarding the activity to be developed and the sample of students is collected. The information that the authors of this paper recommend collecting is the following:

- *Educational level*: Primary, Secondary, Vocational Training, University, and so on.
- *Course*: Level and subject where the activity will take place. Example: BSc of Energy Engineering, subject of "Mechanics"; MSc of Renewable Energies, subject of "Wind Energy."
- *Mode of teaching*: Online, Face-to-face, mixed.
- *Resources*: Class materials, Subject book, Virtual learning platform, and so on.
- *Competences*: Set of competences to be achieved, established in the study program of the subject. Usually, there are three types of competences:
  - Specific competences (SC): Are directly related to the subject-specific knowledge [62].
  - General competences (GC): Are developed to any degree in any area of knowledge, but adapted to the specific context of each subject [29].
  - Transversal competences (TC): Are transferable to other areas of knowledge and can be applied to any professional task (i.e., communication, teamwork, leadership...) [43].

2.2 | Activity design

Traditional activities on Moodle are usually related to "Assignment activities," in which the students have to submit a work, following the teacher's instructions. These instructions can be given online or in a file attached to the activity. The rating of these activities is directly done in Moodle, according to the responses fixed by the teacher, or using complex rubrics predefined by them. When using H5P activities, more effort from the teacher is required, together with a high level of creativity. In this case, the questions are created as individual objects in the Moodle content bank. Moreover, it is common to use any software to edit images, sounds, and/or videos. H5P incorporates more than 40 types of activities, from which many of them can be directly integrated into the grade book [19]. This website provides different tutorials related to the main activities which are included in the H5P framework.

2.3 | Analysis of results

The results are evaluated according to the following instruments and data analysis techniques.

2.3.1 | Instruments

Questionnaires are constantly used to measure the quality of a certain parameter (i.e., to measure customer perception of the product's quality). In this case, the perception of students and teachers regarding the interactive H5P activity is evaluated. The authors want to highlight that only those students and teachers that used the H5P package did these questionnaires. With respect to the students, the questionnaire mainly aims to find out the easiness of using the interactive activity, their degree of motivation, and technical adjustments to make the activity work correctly. In the case of teachers, the aim of the questionnaire is to determine how difficult it is to prepare the interactive activities and the impact on students. These questionnaires were designed by the authors, following recent specific literature [11, 18, 23, 48, 49].

The answers to the questionnaires were based on the Likert scale. Likert scales are a common rating format for questionnaires, as the respondents rank quality from high to low (or best to worst) using five or seven levels

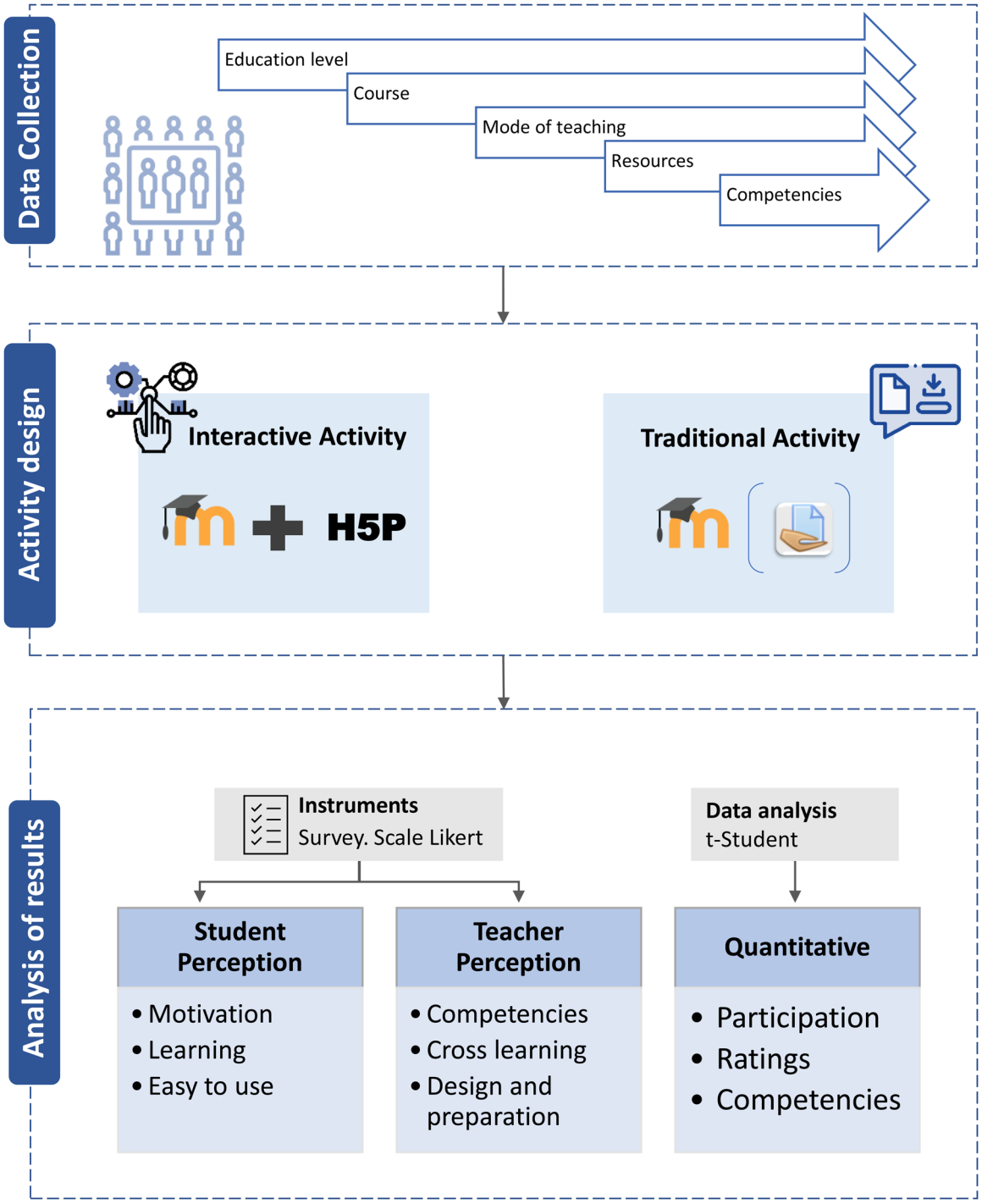

FIGURE 1 Overview of the applied methodology. Own elaboration.

[59]. The responses of the respondents can be very diverse, highlighting:

- *Agreement*: Strongly agree—Agree—Undecided—Disagree—Strongly disagree
- *Frequency*: Very frequently—Frequently—Occasionally—Rarely—Never
- *Importance*: Very important—Important—Moderately important—Little importance—Not important

The steps followed in the elaboration of a Likert scale are the following [31]:

1. Know the variable to be analyzed.
2. Elaborate items related to such variables.
3. Provide the scale to the respondents, who will act as judges.
4. Assign the scores to the items according to their positive or negative position.

5. Determine the total scores to the subjects following the type of response in each item.
6. Perform item analysis.
7. Build the final scale based on the selected items.
8. Apply the final scale to the population in which the instrument was validated.

2.3.2 | Data analysis

A comparison among the participation of the students, the grades achieved (classifying them among outstanding: mark ≥ 9, intermediate: $9 <$ mark ≤ 5, and failing: mark < 5), the competences related to each activity, and the average of the grades is carried out. Related to the last one, and to verify if there is a significant improvement in them, a statistical analysis is performed with the *t*-student test for independent samples. This test is used considering the following hypothesis:

H_0 There is no significant difference between the average of the grades achieved by the students.
H_1 There is a significant difference between the average of the grades achieved by the students.

The t-Student test was developed in 1899 by the English chemist William Sealy Gosset (1876–1937) [61]. This statistical test needs that the samples meet two conditions: they have to follow a normal distribution and their variances should be homogeneous. Currently, it is more common to use the *p*-value to support or reject the null hypothesis (H_0), comparing its value to the critical level (α). The *p*-value is the evidence against H_0:

- If $p \leq \alpha$: H_0 is rejected, so H_1 can be accepted.
- If $p > \alpha$: H_0 cannot be rejected, so H_1 is weak.

A power analysis can also be done to find the power of the test after the hypothesis has been tested.

3 | CASE STUDY

The methodology is evaluated at the university level, within the MSc of renewable energies, specifically in the wind energy subject, considering two groups of students: "Group 1" (G_1, with 40 students) and "Group 2" (G_2, with 35 students). Each group studied the aforementioned subject in a different semester of the same academic year. The mode of teaching of both groups is online, based on a Moodle platform [33] with the H5P package [19] directly integrated. In Table 1, the different competences that must be achieved through this subject are shown. Each group has to carry out an online activity: one of them is a traditional online activity, whereas the other one is based on the H5P package. Both activities account for 10% of the final mark of the subject.

TABLE 1 Specific, general, and transversal competences of the wind energy subject.

Competences	Type
SC_1 — Ability to know the current panorama of wind energy as well as the technology necessary to obtain electrical energy through wind turbines and its export to the grid	Specific
SC_2 — Ability to analyze the different technologies and manufacturers available to create renewable energy exploitation systems, and to distinguish and critically select those qualities based on costs and their actual application	
GC_1 — Ability to handle and analyze relevant bibliography on a topic related to one or more of the areas of renewable energy and energy efficiency, published both nationally and internationally	General
GC_2 — Ability to integrate knowledge and face the complexity of formulating reasoned judgments in the applicable field in a company in the renewable energy and energy efficiency sector, based on information that may be incomplete or limited	
TC_1 — Ability to discriminate use of the basic information systems existing on the network	Transversal
TC_2 — Ability to manage scientific and technical information	
TC_3 — Linguistic skills, such as the ability to communicate verbally and in writing to convey ideas and decisions with clarity and rigor in the presentation	
TC_4 — Capacity for analysis and synthesis	
TC_5 — Acquire a critical position on wrong approaches	
TC_6 — Ability to make the right decisions	
TC_7 — Autonomous learning	
TC_8 — Encourage creativity, initiative, and proactivity	
TC_9 — Adaptation to novel situations	

3.1 | Traditional online activity

The traditional online activity (A_1) is done by G_1 of students: G_1—A_1. This activity includes the following aspects:

- The students have to write down a report, including: cover, summary, table of contents, development (three parts), and conclusions.
- The students have to follow some specifications regarding the format, such as text fonts, header, footer, and so on.
- Before the deadline, the students have to upload their report to a delivery box in Moodle.
- The teacher qualifies the activity by following an evaluation rubric and issues feedback comments.

3.2 | Interactive H5P activity

The interactive H5P activity is A_2, and is carried out by students of G_2: G_2—A_2. With regard to this activity:

- It is based on the *Column* activity of H5P, including 10 questions. The *Column* content type organizes all the questions into a one column layout, creating a coherent learning experience based on different types of questions, such as *Fill in the blanks*, *Find the Hot-Spot*, *Summary*, and *Multiple choice*. Figure 2 shows some examples of the different questions included in A_2.
- Before the deadline, the students have to access the activity and submit it.
- They have three attempts, the final grade is the maximum grade of those attempts.
- The students get their grade once the activity is finished.

4 | RESULTS

The following sections show the main results obtained after using the instruments and carrying out the data analysis.

4.1 | Perception of the interactive H5P activity

The perception of students and teachers who used the H5P package is assessed by analyzing the results of the questionnaires designed by the authors, whose answers were based on a Likert scale including 5 alternatives: from `Strongly disagree` to `Totally agree` (refer to Section 2.3.1).

The questionnaire of students (G_2—A_2) included the following questions:

$S-Q_1$ It was very easy for me to use the interactive activity H5P
$S-Q_2$ I feel more motivated when using the H5P interactive activity than to make a report
$S-Q_3$ I recognize that not all activities can be interactive, there are other skills to evaluate
$S-Q_4$ I used the three attempts of the activity until I reached the highest grade
$S-Q_5$ The H5P activity helped me to collaborate more with my colleagues than other traditional activities
$S-Q_6$ The description of each question favors and helps the execution
$S-Q_7$ It was easy for me to verify the technical requirements of my browser, so that the activity worked correctly
$S-Q_8$ Having a maximum time to carry out the activity made me feel very nervous
$S-Q_9$ Getting the qualification immediately encouraged me to continue with the study
$S-Q_{10}$ I would like to use H5P in more activities and subjects

Figure 3 shows the results for each question. From the students' point of view, 6 questions were valued with more than 50% with the scale of `Totally agree` or `In agreement`: these questions are $S-Q_1$ (75% of students found the interactive H5P activity simple), $S-Q_2$ (55% felt more motivated compared to traditional online activities), $S-Q_3$ (90% recognized that not all activities can be of this type), $S-Q_4$ (60% took advantage of the number of attempts to improve their grade), $S-Q_6$ (65% positively valued the successful execution with the description of the activity), and $S-Q_8$ (65% felt more motivated to continue with the study once the grade was automatically obtained). However, 65% were `In disagreement` or `Strongly disagree` that the activity allowed collaboration with other students ($S-Q_5$), and 30% found it difficult to review the technical requirements for the activity to work correctly ($S-Q_7$), which might be addressed technical problems, and ultimately led to the teacher. There were some questions in which there was not a consensus: with regard to $S-Q_8$, 40% of the students did not find any problem with the time limit, in contrast with 25% that they did; and in $S-Q_{10}$, 35% of students were indifferent to using H5P activities in other subjects, compared to 40% who would like to, and 25% who would not.

The questionnaire for the teachers to find out their perception included two different parts: (*A*) related to the satisfaction with H5P objects, and (*B*) the satisfaction of the activity impact on the students (Figure 4):

A **Satisfaction with H5P objects**
$AT-Q_1$ Learned skills
$AT-Q_2$ Easy to learn

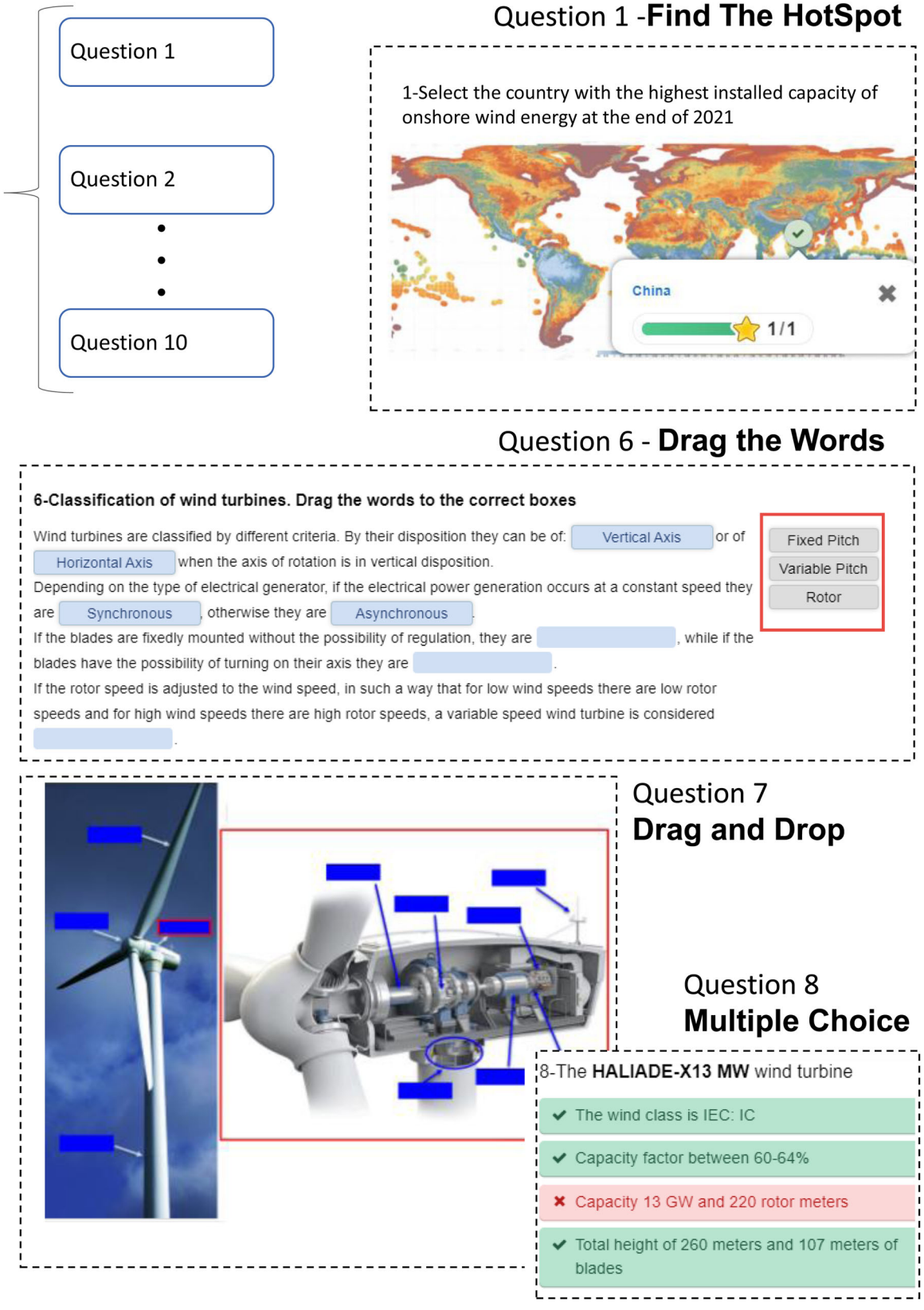

FIGURE 2 Examples of questions from the activity A_2.

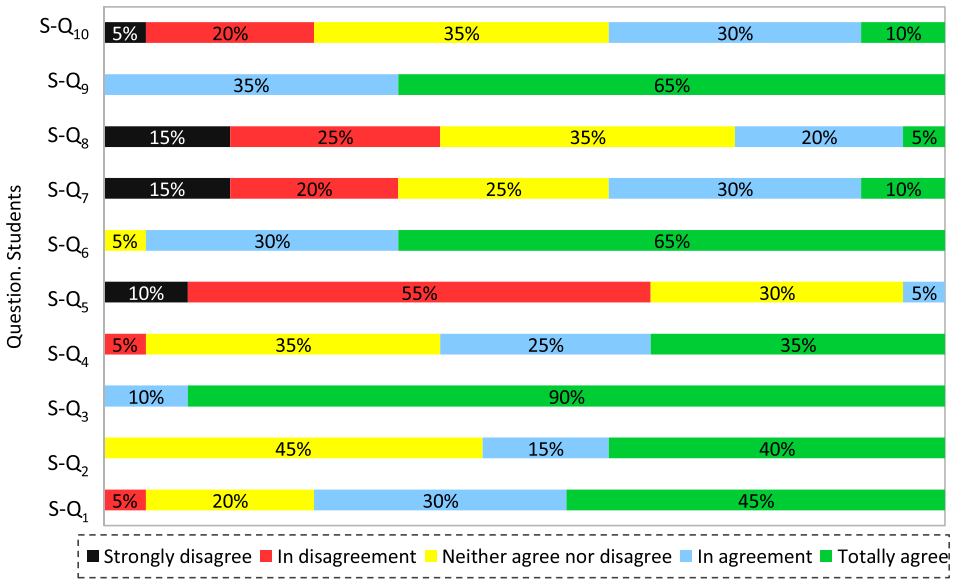

FIGURE 3 Analysis of the results by question. Students.

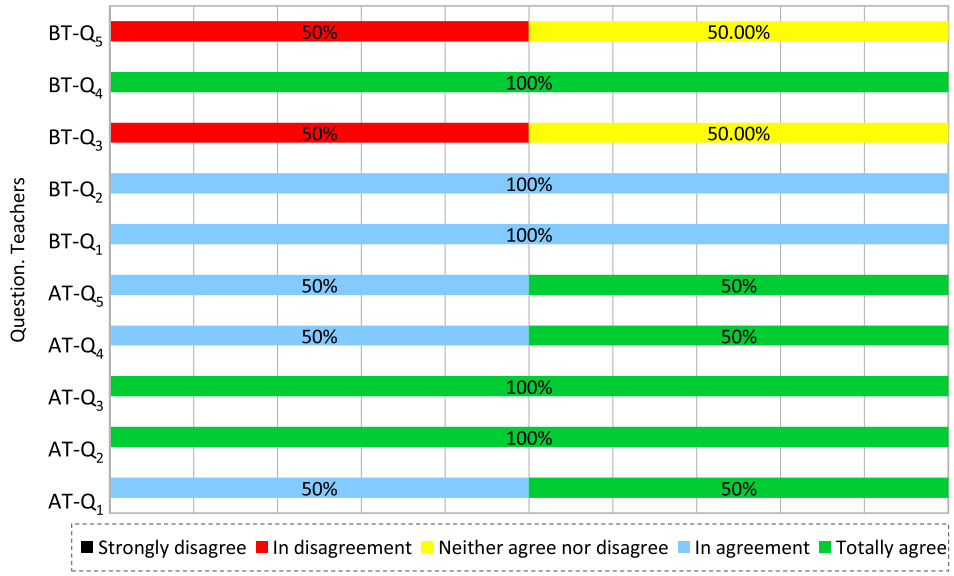

FIGURE 4 Analysis of the results by question. Teacher.

$AT-Q_3$ Requires much more preparation than traditional activities
$AT-Q_4$ Facilitates teaching
$AT-Q_5$ Facilitates learning assessment

B **Satisfaction of the impact of the activity on the students**

$BT-Q_1$ Student motivation
$BT-Q_2$ Student participation
$BT-Q_3$ Student autonomy
$BT-Q_4$ Compliance with specific competences
$BT-Q_5$ Too many errors reported by students

From the teachers' point of view, the questionnaires showed a very positive satisfaction regarding the learning, editing, and teaching work of the H5P objects as evaluative activities ($AT-Q1$, $AT-Q2$, $AT-Q4$, and $AT-Q5$), even though they required much more preparation time than traditional online activities ($AT-Q3$). Furthermore, teachers pointed out that the activity positively influenced the students in terms of participation and motivation ($BT-Q_1$ and $BT-Q_2$), despite the fact that 50% of the teachers expressed that the students were not totally autonomous ($BT-Q_3$). This point was closely related to

the students' question $S - Q_7$. Consequently, it is important to remind students to review the technical requirements for H5P objects to work properly in their browser.

4.2 | Data analysis

The data analysis is evaluated according to:

- **Participation of the students in the activity**: 80% of group G_1 (32 students) carried out activity A_1, whereas 77% of group G_2 (27 students) did the activity A_2.
- **Grade scales achieved**: The extreme grades (outstanding and failures) have significant differences between both activities, see Figure 5. Around 25% of the participants in the G_1—A_1 activity obtained an outstanding rating, whereas 52% reached such a rate in the G_2—A_2 activity. However, none of the students failed in activity G_1—A_1, but 4% of the students of activity G_2—A_2 failed.
- **Average of the grades**: This analysis was carried out with the t-Student test for independent samples with the statistical analysis software SPSS [36]. To perform this test, two conditions must be fulfilled, as detailed in Section 2.3.2: normality and homogeneity of variances. Table 2 shows the result of the data analysis with SPSS of the Shapiro–Wilk normality test, which shows that the condition of normality is obtained for both groups ($p_{G_1-A_1} = 0.081 > \alpha = 0.05$; $p_{G_2-A_2} = 0.063 > \alpha = 0.05$). Levene's test's results are presented in Table 3, fulfilling the homogeneity of variances condition ($p = 0.921 > \alpha = 0.05$). Consequently, the *t*-student test can be performed. Table 4 shows the mean grade, the standard deviation, and the mean of the standard error, indicating that the students of the activity G_1—A_1 achieved a relatively lower grade than those of the G_2—A_2 ($7.84 < 8.40$). Thus, authors proceed to check if these means are significantly different and can reject the null-hypothesis H_0 (i.e., if G_2—A_2 significantly improves the average grade with respect to G_1—A_1). Finally, through the t-Student test for independent samples (Table 5), the results show that with the *p*-value obtained, there is no evidence in the

TABLE 2 Normality test.

	Shapiro–Wilk Degrees of freedom (gl)	*p*
G_1–A_1	32	0.081
G_2–A_2	27	0.063

TABLE 3 Homogeneity of variances test.

	Levene's statistic	*p*
Mean grade	0.010	0.921

TABLE 4 Group statistics.

Group-activity	Degrees of freedom (gl)	Mean	Standard deviation	Mean of the standard error
G_1–A_1	32	7.8359	1.44330	0.25514
G_2–A_2	27	8.3978	1.50288	0.28923

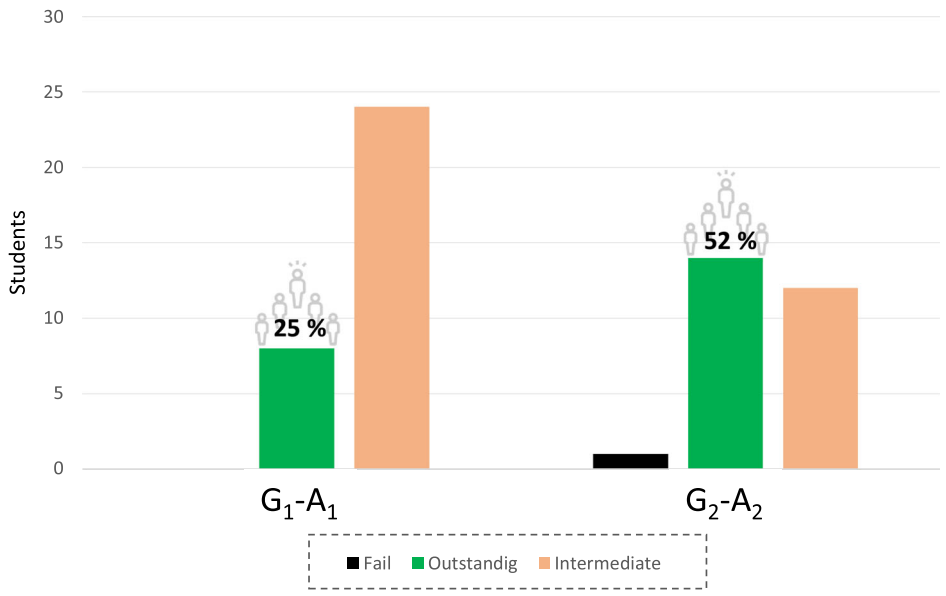

FIGURE 5 Grade scales achieved.

mean grades to claim that there is a difference between the two groups. Consequently, the null-hypothesis H_0 cannot be rejected, and no significant differences between the means of the grades of the activity G_1—A_1 and the activity G_2—A_2 are found. Moreover, when performing the power analysis, a value of 0.299 is obtained, that is, there is a 30% possibility that there's a relationship between the type of online activity (traditional or interactive with H5P) and the mean grade obtained; Figure 6 shows the estimated power depending on the difference of means of the groups. Therefore, from this statistical analysis it is inferred that the interactive H5P activity developed did not present a significant improvement in the average grade, compared to the traditional online activity (G_1—A_1).

- **Competences**: All the competences but TC_9 (≈92%) are achieved in the traditional online activity G_1—A_1. TC_9 cannot be considered in this case, as the activity G_1—A_1 does not include any novelties. On the other hand, through the interactive H5P activity G_2—A_2, students achieve ≈70% of the competences. In this case, GC_2, TC_3, TC_4, and TC_8 cannot be evaluated directly through the activity, as there is no need to formulate complex conclusions (GC_2) and the activity makes it impossible to assess linguistic skills (TC_3), determine the ability of the students to analyze and synthesize (TC_4) and assess the creativity and initiative of the students (TC_8). An overview of the competences for both activities is depicted in Figure 7.

TABLE 5 Result of the comparison of the means for the t-Student test for independent samples.

	t	gl	Sig. (*p*)	Mean difference	Standard error difference
Equal variances	−1.462	57	0.075	−0.56184	0.38434
Not equal variances	−1.457	54.52	0.075	−0.56184	0.38568

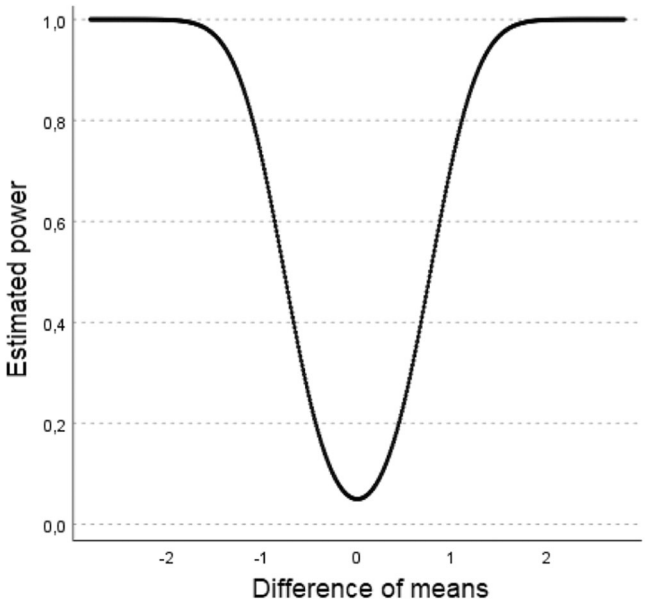

FIGURE 6 Estimated power depending on the difference of means.

5 | CONCLUSIONS

Online teaching and learning activities are gaining popularity due to their relevant advantages, such as low cost, wider access, and flexibility. Moreover, the online learning implementation during the post-pandemic has increased considerably, overcoming previous potential negative attitudes and beliefs about online learning benefits and values within the university educational environment. With this aim, a variety of online activities have been developed and proposed for virtual classrooms. Among the different online solutions, H5P is a free and open source platform allowing the creation of interactive content to be embedded in virtual teaching and learning. This paper compares a traditional online activity and an interactive H5P activity in terms of students' participation, grade scales achieved, average of the grades, and competences involved in each one of them. Moreover, the perception of students

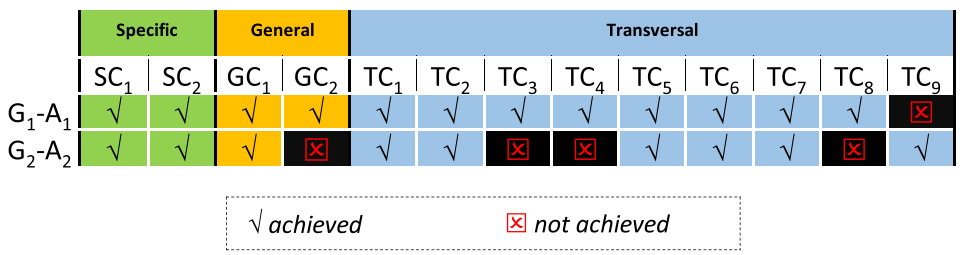

FIGURE 7 Specific, general, and transversal competences achieved.

and teachers that used the H5P-environment is also assessed.

From the results it is derived that:

- The perception of students and teachers who used the H5P package is from the students' point of view, six questions were valued with more than 50% with the scale of Totally agree or In agreement.
- The questionnaire for the teachers to find out their perception included two different parts: (A) related to the satisfaction with H5P objects, and (B) the satisfaction of the activity impact on the students. The questionnaires showed a very positive satisfaction regarding the learning, editing, and teaching work of the H5P objects as evaluative activities.
- The participation of the students in the activity were 80% of group G_1 carried out activity A_1, whereas 77% of group G_2 did the activity A_2.
- The grade scales achieved shows that around 25% of the participants in the G_1—A_1 activity obtained an outstanding rating, whereas 52% reached such rate in the G_2—A_2 activity. However, none of the students failed in activity G_1—A_1, but 4% of the students of activity G_2—A_2 failed.
- Related to the average of the grades, no significant differences between the means of the grades of the activity G_1—A_1 and the activity G_2—A_2 are found.
- And finally in competences, through the interactive H5P activity G_2—A_2, students achieve ≈70% of the competences, the activity makes it impossible to assess linguistic skills (TC_3), determine the ability of the students to analyze and synthesize (TC_4) and assess the creativity and initiative of the students (TC_8).

As future work authors want to explore two ways:

- Assess the hypothesis of the existence of significant differences in the perception of students and teachers in both groups, using the instrument of Likert scales with a large number of alternatives, to achieve results with an approach closer to the normal distribution [58].
- Use the technology acceptance model (TAM) as a theoretical framework that explains how users adopt and use new technology. The TAM suggests that the acceptance and usage of a technology depends on two main factors: perceived usefulness and perceived ease of use. The TAM provides a useful framework for understanding the factors that influence the adoption and usage of technology, and can be used to inform the design and implementation of new technologies. TAM can be applied to the adoption and usage of H5P, which is an open-source technology that allows the creation of interactive and engaging learning content. The TAM framework can be useful in understanding the factors that influence the adoption and usage of H5P, and can be used to inform strategies for promoting its adoption and integration into educational practices [51, 52].

In addition, Lemay et al. [25] affirmed that, whereas students mostly responded positively to the online transition process, their reluctance to continue learning online would require that educational technologists and teachers attend to both affective and social dimensions of such online learning paradigm, which is a current field of interest for the authors.

Finally, it is important to remark that the competencies of any subject must be achieved by all the activities that integrate it, therefore, the authors recommend using interactive activities combined with traditional online activities.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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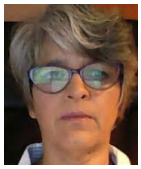

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How to cite this article: I. C. Gil-García, A. Fernández-Guillamón, M. S. García-Cascales, and Á. Molina-García, *Virtual campus environments: A comparison between interactive H5P and traditional online activities in master teaching*, Comput. Appl. Eng. Educ. 2023;**31**:1648–1661.
https://doi.org/10.1002/cae.22665