

# Enhancing learning in higher education using MOOC: The experience of the University of Padua

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**Abstract.** Research on massive online open courses (MOOCs) is growing, but critical points about their use in blended courses are still being investigated and reported. A new MOOC designed on the principles of constructivism was launched on the FutureLearn platform by the University of Padua in October 2020 and was offered as an optional course to 31 students in a master's degree program. A case study methodology allowed the authors to explore its effectiveness in terms of improving participant learning, promoting learner engagement, and assessing learner satisfaction. A variety of data sources were used, and an in-depth study of the learning experiences reported by the students was carried out. Overall, the experience was effective, offering an example of an active and engaging MOOC that overcame challenges previously reported in the literature. Excellent results emerged from its use in the blended course, as it proved to be a valid integration tool for the development of new skills and knowledge in an international online environment; the course has helped open new paths for the use of MOOCs in the academic context.

**Keywords:** blended program, online courses, university, active learning, learners' perspective

## 1 Introduction

Interest in active learning (AL) is becoming relevant to education research, especially regarding adult education [1, 2]. AL has been defined as “instructional activities involving students in doing things and thinking about what they are doing” [3]. It “is the process of engaging learners with the topic and each other where they are talking, doing, and creating, together” [4]; in this way students construct their learning by interacting with the context, accessing higher-order thinking, and delving into their own attitudes and values [4, 5].

The COVID-19 pandemic has destabilized university communities around the world by forcing the sudden replacement of in-person teaching with distance learning [6]. Doubts and perplexities have been expressed by many teachers regarding distance

teaching [7], which some consider a hostile environment for learner engagement and not always as effective as face-to-face teaching. Indeed, the pedagogical effectiveness of online courses, especially massive open online courses (MOOCs), remains a matter of intense debate among researchers, as we discuss below.

As part of a trend toward distance learning that predates COVID-19, the University of Padua activated a MOOC project in the 2014–2015 academic year with the aims of improving the quality of higher education, “enhancing the university’s international presence [...], encouraging the use of different languages” among learners [8], and promoting university-society interaction and lifelong learning. In this context, MOOCs in several areas of study have been realized and delivered; at present, 11 MOOCs are hosted by the FutureLearn platform, 6 by EduOpen, and 4 by Federica.EU<sup>1</sup>.

The present study aims to investigate the learning experience of the learners who attended the MOOC “Innovative Teaching: Engaging Adult Learners with Active Learning,” with a particular focus on a group of master’s degree students who voluntarily participated. This MOOC specifically fosters learning using AL methods and has been developed and hosted by the FutureLearn platform. The level of satisfaction, the engagement, and the learning processes of learners are explored to better understand how a MOOC can improve learning in blended courses.

## 2 Theoretical Framework

MOOCs “are one of the important outputs of connectivism” [9]; the several generations of MOOCs have a range of connections to the main theories of learning. A first generation of MOOCs that promoted the connectivity and exchange of social networks and the accessibility of online resources [9-12], was succeeded by a second generation in which the organization of activities was determined by teachers, who followed the principles of behaviorism [11, 12]. Later another MOOC model was developed by combining the principles of constructivism and connectivism [11].

MOOCs designed along the principles of constructivism [9, 13-16], offer opportunities for cooperative learning [17] through a collection of activities, such as online forums, group work to carry out projects, case analysis, panel discussions, peer assessment activities, and dedicated spaces for question-and-answer sessions [18-20]. Support agents are usually involved to stimulate collaboration and interaction among participants [12] and to create communities of inquiry [21, 22]. These kinds of MOOCs also attempt to promote AL [1, 3, 4] by supporting learning through ongoing quizzes and real-life learning applications [18]. All these activities are also designed to give prompt feedback to learners [18, 20]. Moreover, they provide a variety of resources with the aim of “addressing diversity of learners” [18]. With the same intention, they allow for integration through group or individual offline activities [20], equip learners with short videos and summary related to the content of the course [12, 20] and analyze learners’ behaviors and preferences to create personalized quizzes [12].

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<sup>1</sup> Data retrieved in the official page of the University of Padua <https://www.unipd.it/mooc>, last accessed 2021/04/12

There has been growing international interest in the use of MOOCs in blended curricula [23-26]. Indeed, MOOCs have been used to harness the potential of blended learning, which has been defined as the “thoughtful integration of classroom face-to-face learning experiences with online learning experiences” [27], combining the mainly online content and activities of the MOOC with face-to-face classroom learning [28]. Prior studies have proposed models to design this integrated setup. Zhang’s five models focus mainly on the purpose of MOOCs: (1) learner services for MOOC participants, with MOOCs as part of a service provided by the university; (2) MOOCs as open resources, where MOOCs are used to supplement classroom learning but are not necessarily part of the curriculum or used as integral parts of classes; (3) flipped classrooms, in which the content of a MOOC is used to study at home; (4) challenge courses for MOOCs, with projects used to assess learning previously conducted in a MOOC; and (5) credit transfer from MOOCs, where completion of a MOOC earns extra credit in a given class [29]. On the other hand, the model of Kloos et al. [25] focuses on MOOC delivery rather than purpose [30] and describes six types of experiences: (a) local digital prelude, which usually functions as a preparatory class for freshmen or students who need to fulfill certain prerequisites; (b) flipping the classroom, with students initially working through the MOOC content at home and then reinforcing that learning in class; (c) canned digital teaching with face-to-face tutoring, which functions as reinforcement classes for those students who have failed a semester and work independently on a MOOC aligned with the curriculum but can still consult with the professor instead of having to take a class again; (d) face-to-face and canned teaching, where the material for a MOOC is used to supplement a face-to-face class; (e) face-to-face teaching with remote tutoring, where experts are invited to teach from a distance; and (f) canned digital teaching with remote tutoring, where the MOOC content is supplemented by remote tutoring from a professor.

Along with the spread of MOOCs, research confirming that student retention is one of the most critical aspects of MOOCs is increasing. A little under a decade ago, it was found that only 7%–10% of enrollees typically completed a MOOC course [31, 32]. Therefore, some researchers have sought to identify factors related to course dropout: dissatisfaction with interactions with classmates and educators, inadequacy of course design, presence of challenging assignments, setting deadlines for assessment and missing learning support and scaffolds, use of transmissive teaching methods and lack of interactive and collaborative assignments, difficulty navigating the platform, the inadequacy of quality of teaching materials, and a lack of engagement and motivation [33-37].

Critical issues in the use of MOOCs in hybrid format have also been reported, and there is substantial overlap with those enumerated above. A lack of experiments integrating MOOCs into traditional classrooms has been reported, which contributes to the challenge of synchronizing the two paths of teaching that educators often face [38]. MOOCs are generally teacher-centered and learning outcomes can be compromised in that kind of format [39]. Moreover, some instructors found it challenging to ensure student engagement, satisfaction, and ultimately learning [23]. This concern was confirmed by Atiaja and Proenza, who noted that little “value is placed on participation

and/or student's interaction with peers and teachers [... and] the course content is not innovative or interactive in comparison with new technology" [40].

In response to these concerns, greater "levels of student engagement" are considered relevant to successful learning in MOOCs [41]. Moreover, the consequences perceived by learners, such as "knowledge growth, social interaction, compatibility, and affect," and using MOOC positively impact learning [35]. Researchers at the Australian National University examined whether studying through a MOOC integrated with in-person courses was effective. Interviewing students in four popular courses in modern astrophysics, they found that 87% of those enrolled declared that they learned much more than in face-to-face classes [42]. The potential and effectiveness of MOOCs for learning have been confirmed by other researchers, who have found that "students in blended MOOCs in traditional classrooms performed almost equal or slightly better than students in only face-to-face class environment" [38].

Within this framework, the MOOC "Innovative Teaching: Engaging Adult Learners with Active Learning" was developed at the University of Padua in 2020.

### 3 Methodology

The MOOC was designed in line with constructivist principles and proposed as an optional activity in the second year of a master's program in adult and lifelong learning during the 2020–2021 academic year. The MOOC's content was developed by three professors from different universities and hosted on the FutureLearn platform.

The course was launched on October 26th, 2020 and lasted for four weeks. However, active moderation in the course was extended for two more weeks to accommodate latecomers, and the course remained open (without moderation) until May 2021. During the MOOC's initial four-week run, each professor was assigned a week to facilitate the discussion, with an additional member of the team assisting them in moderating comments and feedback. In addition to its educational purpose, the study had the goal of overcoming the challenges found by previous researchers in fostering student engagement in MOOCs by exploring their learning experience. Therefore, the guiding research questions were:

How satisfied were learners with the MOOC, based on their learning experience? To what degree did the MOOC meet their expectations?

How effective was the MOOC in terms of improving participant engagement and learning?

A case study methodology was chosen because it allowed the researchers to narrow the units of analysis so that each had its own structure, was delimited in terms of space, time, and actors, and was characterized by unity and specificity [43]. The researchers attempted to investigate the learning experience of the learners by using a variety of data sources [44], with a specific focus on master's degree students. This was based on Bali's suggestion that it makes more sense to investigate MOOCs individually, as the perceived success of a given MOOC is relative and depends on a wide variety of factors [18]. A multitude of variables occur in the complex environment of a MOOC; therefore,

a limited picture is offered when the success of a MOOC is determined only by the achievement of certain standards, such as the run retention index.

The analysis is based on the course's 1067 enrollments, whose characteristics are described in Table 1.

**Table 1.** Percentages of enrollments by gender, countries, age, and employment status (n. 1067)

Gender		Countries <sup>2</sup>		Age		Employment status	
Male	31%	United Kingdom	21%	18-25	12%	Working full time	45%
Female	69%	Italy	10%	26-35	26%	Working part time	21%
		United States	5%	36-45	25%	Self Employed	15%
		Australia	4%	46-55	25%	Full time student	9%
		India	3%	56-65	9%	Looking for work	6%
		Brazil	3%	65+	3%	Retired	2%
		Russia	3%			Unemployed	2%

Nearly a quarter (24%) of joiners completed at least half of the steps in the course, and 18% completed 90% or more of them. This last portion of MOOC learners was analyzed more closely, with the opinions of those who completed the course and responded to the final survey (n=86), including 31 students (26 female, 5 male) in the master's program. It should be noted that in this paper we use the words "learners" or "participants" to refer to all those who attended the MOOC, including the master's students, and the word "students" to refer exclusively to those master's students. As noted above, to answer the research questions, the researchers explored the opinions of the learners, paying particular attention to the students' views. Therefore, the data obtained from the FutureLearn portal, including learners' demographic data, the end-of-course survey, and the activities report were analyzed. In addition, students responded to a critical incident questionnaire (CIQ) at the end of each week [45, 46].

There were three main sources of data:

- a survey provided on the FutureLearn platform and submitted to learners when they completed all the steps of the course. It aimed to collect information on participants' satisfaction and was composed of four closed-ended questions and two open-ended questions.
- activity report, concerning the activities carried out by the learners, which helped the researchers infer their learning progress and interactions.

<sup>2</sup> Only data related to the most frequent countries are reported.

- a CIQ submitted at the end of each week of activities by the master's students (n=31) consisting of six open-ended questions that investigated their learning experience and the level of engagement.

Descriptive statistics analyses were conducted on the quantitative data using Excel. Qualitative data were analyzed with the ATLAS.Ti 8 software, a CAQDAS (Computer Assisted Qualitative Data Analysis Software) that supported the text analysis.

## **4 Results**

The study results are reported into the three following sections. First, the results of the final survey, through which the researchers investigated learners' overall satisfaction, are presented. These data answer the first and (partially) the second research questions. In section 4.2, the quantitative data gained from the activity report are described; they were useful for interpreting participants' learning progress and interaction and beginning to zoom in on the student learning experience. Finally, the qualitative analysis of the CIQ completed weekly by students is reported, which paid more attention to the students' perceptions and reflections on their learning experiences. The data in the second and third sections answered the second question posed by the researchers and allowed them to reflect on possible improvements in the MOOC.

### **4.1 Final survey results**

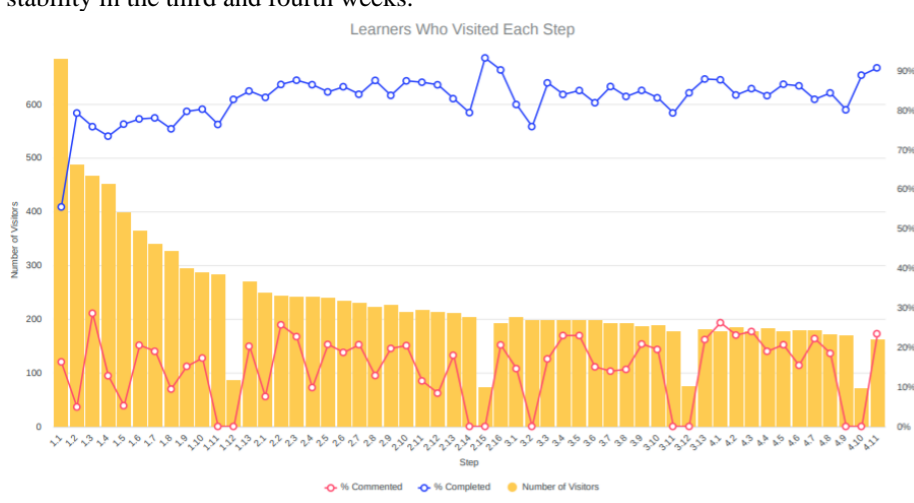
This section presents the data collected from the end-of-course survey on FutureLearn. Among learners who completed the course, 86 participants completed the final survey, including master's students.

Almost all respondents indicated they were satisfied, declaring that the course met their expectations (49%) or that it was even better than expected (48%). They also agreed that new knowledge or skills were gained by taking the course (94%), with most acknowledging that they had applied what they had learned (74%) and shared their learning with other people (68%).

Participants used this space to express their appreciation for the course they had just completed and to make suggestions for its improvement. Some indicated approval of the course's format, content, and ability to bring people from different backgrounds into a dialogue, while others emphasized the effectiveness of the course, as these examples indicate: "I think this course is a great opportunity to discover different points of view, to dialogue with other perspectives and people" (learner 1), and "I found this course very useful for my job and feel it will really improve my ability as a teacher" (learner 2). Other participants suggested offering a free certificate for those who could not afford upgrades or using videos from a source other than YouTube because it is restricted in some countries.

## 4.2 Activity report

The activity report provided learners demographics and allowed the authors to gain an overview of the course run in terms of learners' progress and interactions. As noted above, not all those who enrolled completed the course; a run retention index of 41.5% was recorded. The number of visitors and the percentages of comments and completion of each step were also taken into account, as shown in Fig. 1. The same graph reveals how the number of visitors to each step gradually decreased before reaching a certain stability in the third and fourth weeks.



**Table 2.** Number of comments and average number of comments per learner for each week of the “Innovative Teaching: Engaging Adult Learners with Active Learning” MOOC course.

Week	1	2	3	4
Comments	988	914	612	577
Average comments per learner	5	11	10	10

Looking in detail at the master’s students’ activity report reveals that they completed an average of 99% of the steps. Over the four weeks, these students posted a minimum of 26 to a maximum of 96 comments, with an average of about 58 comments per student. Students achieved an average score of 92% on the weekly quizzes over the four weeks, with 75% their lowest overall score, and six students achieved 100%.

### 4.3 Critical incident results

The CIQ collected qualitative data solely on the students’ learning experiences.

Before presenting the results, we briefly introduce the instrument. The CIQ is useful for educators to obtain accurate information about students’ learning, monitor what was significant for that learning, and adjust their teaching according to the information gathered [45, 46]. In fact, the choice to use this tool was closely linked to the educators’ desire to investigate students’ opinions more thoroughly for each week of the course and understand which activities were working and which were not. Therefore, at the end of each week, the students were asked to provide six pieces of information: a) the most engaging moment of the week, b) the least engaging moment of the week, c) the most surprising thing during the week, d) the most important thing learned during the week, e) the topic students would like to explore more fully, and f) any further suggestions for improvement. Again, the qualitative data reported below refer to the master’s program students and are presented week by week.

**First-week results.** The first week’s most engaging activities were reflective, such as identifying personal teaching and learning assumptions. These activities were appreciated because they encouraged students to meet with other learners and develop group activities to reflect on their personal beliefs through case studies and examples of real situations. Another engaging aspect was reading and exchanging written comments with other learners, because it allowed students to gain new perspectives, exchange feedback, and interact with other participants. However, activities related to the teaching perspective inventory (TPI) [47] were less engaging because they required students to imagine teaching situations that most of them had not experienced, which left most students feeling disoriented; they had difficulty understanding the task. One of the most



positive aspects for students was the international and interactive nature of the course and, as had already emerged, the possibility of exchanging ideas with other learners. The importance of reflective practices and learning through knowledge sharing were cited as the most important learning experiences of the first week. Students asked that more time be devoted to contextualizing educational philosophy, particularly in online environments, delving into the skills and strategies required of teachers to cope with a variety of situations, and the results of the TPI. Students made a number of interesting suggestions to improve the first-week activities: using more videos and images to summarize content, support learning, and foster involvement and enjoyment; introducing direct chats to foster participants' interaction; and providing alternative activities for non-teacher participants.

**Second-week results.** During this week, most students found the videos related to the interactive lessons very engaging. Others found information about interactive teaching methods excerpted and adapted from Bierema's chapter "Incorporating Active Learning into your Educational Repertoire" interesting [48]. This week's survey results revealed a particularly high level of engagement, with only three students less engaged when they encountered some redundancies. The explanation and connotations of AL surprised students the most, such as the variety and effectiveness of the strategies that can be used to promote it and their wide range of application. They were also surprised by the effectiveness of small changes in traditional lectures to improve learners' engagement (such as question-posing style and changes in tone) and by discovering the important role of experience in the learning process reflecting on bad learning or sharing past experiences. Consistently, the most important learnings involved strategies and methods to foster AL and student engagement, the efficacy of small changes to counteract resistance and deliver a greater impact, and the importance of adapting teaching methods to situational needs. The second-week activities were adequately developed, according to most of the students; however, they would have liked more examples of applications and interactive strategies. Another reported curiosity concerned exploring students' opinions and feelings about different teaching techniques and the consequences of poor teaching on learners. Among the students' suggestions to improve the activities, the use of more videos emerged again; they also suggested considering the time and effort required to develop the tasks, some of which needed more time and were more challenging than the students had expected.

**Third-week results.** Activities that required planning a lesson or course were successful this week. They gave students a chance to approach this type of experience by imagining real situations, comparing themselves to other participants, and reflecting on learner-centered teaching. Again, this week engaged the students most of the time. Some students felt unchallenged by the quizzes, while others felt unprepared to undertake an assessment of their teaching, as they lacked this type of experience. Still others found difficulties using the learning designer tool. Most students faced teaching planning for the first time in the MOOC; therefore, they were surprised by some of its aspects, such as the discovery of useful tips, strategies, and techniques, the need to have time management skills, the effort required to plan even a single lesson, and how

important an appropriate opening class is to the overall progress of a course. Students were surprised to discover how useful group discussions with other learners were for their own learning. Therefore, effective, detailed teaching planning, co-constructed and shared with learners and anchored to learning outcomes was the master's students' most important learning experience of the week. Additional information and examples on planning principles, time management, how to improve planning skills, and how to use the learning design tool properly were requested. The presentation of more examples, videos, images, and summary grids were also recommended.

**Fourth-week results.** In the final week, students were engaged and especially enjoyed learning about feedback. In fact, the students recognized feedback as essential for learning and widely usable in different contexts. Second, they appreciated having the opportunity to share assessment practices and strategies. The task on assessment was useful and involved reflection, creativity, and comparison with other participants. As with the first week, the least engaging activities were those that required teaching experience, which involved reflection on and sharing one's teaching practices. Some other students encountered topics they were already familiar with and criticized the length of some of the articles provided, so they identified these moments as less interesting. In addition, in this week, learning through comment sharing was a source of surprise for the students, accompanied by the reflection on assessment and feedback. Features of effective feedback and assessment for learning were the more interesting topics learned, although additional examples about their impact on emotions, promotion of student-educator feedback, authentic assessment, and differences between various types of assessment (i.e., assessment of, as, or for learning) would have been appreciated. The use of more videos and images was suggested for activities in the last week, as were strategies such as case studies, role play, and online meetings. As in the first week, the creation of alternative activities for those without teaching experience was suggested.

## 5 Discussion and conclusions

The percentage of learners who completed the MOOC in this case study is higher than percentages considered average in the consulted literature, as it registered a high run retention index. However, as explained in the methodology section, we do not dwell on this single datum; rather, we evaluate the effectiveness of the MOOC based on learners' opinions.

To answer the first research question, almost all learners were satisfied with the MOOC, which exceeded their expectations, according to the data obtained from the final survey. In the same survey, learners reported having acquired new knowledge and skills by attending the MOOC. Specifically, the learnings reported by the students through the CIQ were largely related to the following topics: assessment and feedback, teaching planning, AL strategies, and the importance of learning through knowledge sharing and reflective practices. The scores recorded during the weekly quizzes also confirmed a positive learning experience. Therefore, the intended learning outcomes were successfully achieved, which answers the second research question.

In support of the second question, a digression on students' engagement was helpful; indeed, they stated that they always felt engaged in the MOOC's activities, except when they encountered inexperience in the subject. This was reported mainly in one activity in the first week, which focused on students' identification of their teaching philosophy [47, 49], and another in the fourth week, which required the students to share examples of their teaching strategies using real-world situations. The most engaging activities were those that involved videos, case studies, reflection on real-life situations, knowledge application, discussion, and comparison among learners. The high levels of engagement, learner interaction, and learner retention achieved in this first run of the MOOC provide powerful evidence of the effectiveness of the activities offered by MOOCs built in line with the principles of constructivism and AL discussed in the theoretical framework [18-20]. In fact, there is already evidence in the literature that correlates AL and student satisfaction [1, 50] and that designates AL a preferred learning style among students who have attended other MOOCs [51]. Therefore, the use of these kinds of activities appear to offer a solution to the concerns expressed by Bruff et al. about the difficulty of creating MOOCs that are satisfying and engaging [23]. These indications could be useful to other scholars who want to develop new MOOCs or complement and improve existing MOOCs.

The CIQ has been used by other researchers to explore the MOOC learning experience [52, 53], in the present study it also proved a valuable tool for investigating the surprising aspects of the MOOC as perceived by students: specifically, the possibilities offered to students by the MOOC in addition to the blended course they attended. They were pleasantly surprised not only by the topics covered but also by the opportunity to interact with people from different professional and cultural backgrounds. They enjoyed learning interactively and from the experiences reported by professionals. Indeed, "learning through the experience of others," "learning through group discussion," and "learning about new perspectives through reading the comments of other learners" were all aspects stressed frequently by students in almost every week's CIQ. The 31 master's students from the University of Padua were very active in the discussions, and the overall comment exchange among all learners was good, reaching an average of about 10 comments per learner in the last three weeks, according to the activity report. From this perspective, MOOCs could be a valuable tool to encourage interaction between students from different countries, thus reducing mobility costs, and between students and professionals in an international online environment. Based on what was found in this case, it is not surprising that the educational and attractive character of MOOCs among students, workers between 25 and 40 years old, and retired people from both developed and developing countries has already been stressed [54]. MOOCs thus offer an effective way for universities to open themselves to international society and reach new groups of possible enrollees.

The data collected from the students also allowed the researchers to reflect on possible improvements to the MOOC, and the MOOC's second run has been implemented based on the interests, criticisms, and suggestions collected through the CIQ. Video resources offering further explanation and examples related to TPI and educational philosophy were added to week one; a reading on "small teaching" adaptations that can improve student engagement in online teaching was added to week two; a video tutorial

on using the learning designer tool, examples, and a summarizing infographic related to principles for designing effective lessons in line with AL principles were added to week three; one video resource to clarify assessment as, for, and of learning and another with students' opinions on the use of feedback in university contexts were added to week four; and finally, optional resources for deepening the topics covered were added in all weeks.

The studied MOOC, which can be labeled as the second purpose type identified by Zhang [29] and the fourth delivery type according to Kloos et al. [25] classification, offered engaging activities and interesting topics, leaving the floor open to participants to learn in an interactive, cooperative, and active manner and suggesting the appropriateness of constructivist principles for this type of online course just like other emerging approaches for distance learning [55]. The intended learning outcomes were achieved, and the MOOC proved to be a positive resource within the blended program, overcoming the challenges previously reported in the literature and empirically helping to support the findings of other scholars who see MOOCs as an additional and effective resource to traditional courses for cognitive growth, improved performance, and students' engagement and interaction [35,38,41,42]. Improving the MOOC and the tools for collecting learners' opinions about the learning experience is our next step. In fact, among the limitations of the study, it is fair to mention the number of students involved in the research and the general nature of the information collected from the other learners about their opinions. These could be remedied through the implementation of the assessment process and instruments and the longitudinal conduction of the study in subsequent runs. Comparisons with other experiences of this type may be of interest to scholars in the field. International interactions and the dialogue between students and professionals are important aspects that emerged in the research that could be further explored and suggest important advances for university courses.

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