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RESEARCH ARTICLE

The use of learning management systems in ESP to explore postgraduate students' content knowledge about epidemiology and COVID-19: a mixed-methods study

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ABSTRACT

Background/purpose – This sequential explanatory mixed-methods study inspected the impact of an online ESP course on postgraduate students' content knowledge development about epidemiology in general and COVID-19 in particular. The course was titled "*English for Pandemics*" and was administered via a Learning Management System (Edmodo).

Materials/methods – Needs Analysis was (informally) deployed to trace participants' needs, preferences, and wants in order to shape the landscape of the treatment. The researcher employed a quasi-experimental design (a one-group, pretest-posttest design). Participants were pretested prior to the treatment. The treatment consisted of online exposure to eight units (English for Pandemics), capitalizing on Edmodo in content delivery, receipt, mastery, and assessment. Following the treatment, after 8 weeks, the participants were post-tested.

Results – Quantitative results revealed a statistically significant difference in the participants' content knowledge regarding epidemiology and COVID-19. Qualitative findings divulged that participants highly appreciated Edmodo interactive features (simplicity, functionality, control, communal learning, and real-time feedback), and voiced their readiness to opt for Edmodo in future learning experiences.

Conclusion – Based on empirical evidence, the current study argues that the Edmodo learning management system has the potential to push content delivery, receipt, mastery, and assessment in ESP courses to the next level.

Keywords – Educational technology, English for Specific Purposes (ESP), Edmodo, content knowledge development (CKD).

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1. INTRODUCTION

Undeniably, the COVID-19 pandemic has and still does present an extreme challenge to higher education systems worldwide. Many countries have issued countless procedures to slow down the spread of the virus, including the shutdown of universities and campuses. UNESCO stated that, as of May 17, 2020, almost 1.21 billion learners had been affected, accounting for 69.3% of the world's student population (Huang et al., 2020). The pressing issue was, then, and still today, how to sustain higher education amid such a crisis. A pendulum shift from classroom-based courses towards an online, synchronous, video-based format was firmly thrust upon numerous schools and universities as a timely response and an agile reaction to sudden campus closures (Bozkurt & Sharma, 2020; Huang et al., 2020; Karakose & Malkoc, 2021a; Karakose & Malkoc, 2021b).

The transition presented considerable challenges for academic staff, many of whom needed higher levels of technology competency and proficiency than they had previously acquired, as well as for students who suffered from feelings of isolation through not being able to interact with their classmates or attend in-person classes (Gillett-Swan, 2017). In order to initiate a smooth transition, stakeholders, policymakers, university leaders, and academicians have been invited to come up with answers to two tough questions so as to guarantee the continuance of learning: 1) What is the best way to rapidly spin-up and deliver online courses? and 2) How can colleges ascertain that all students have easy access to the technology required for distance online learning?

Globally, huge efforts have been deployed by university teachers to conduct classes via videotelephony software such as Zoom and Meet (Kristóf, 2020; Marek & Chew, 2021). Indeed, during the initial time of crisis, there was an urgent need for well-rounded and effective educational practices in terms of content knowledge delivery alongside the most efficacious e-learning tools. Locally, Moroccan higher education institutions faced an unprecedented challenge. Addressing this new reality and surviving the disruption, the Moroccan universities invited their teaching staff to learn the ropes of online teaching-learning, to share best practices, and to create (rapidly and professionally) digital resources to a) keep up with the constantly changing e-learning (teaching) environment, b) reach university students remotely, c) limit the disruption to education, and d) guarantee educational (andragogical) continuity (Draissi & ZhanYong, 2020; Hibbi et al., 2021).

Problem Statement

To address the status-quo, the researcher used *the ideal, the reality, and the consequences approach* (Bwisa, 2018) in order to show that the problem exists and needs to be solved. The researcher reasoned the need to transform this challenge (lockdown = universities' shutdown) into an opportunity for the study population.

The ideal was to generate a science-based response to COVID-19. However, *in reality,* there was no course on epidemiology in general and COVID-19 in particular in the SAB course catalogue to help the participants handle this unprecedented outbreak. Fake news and myths about the novel coronavirus made things worse. Phrases and words such *social distancing, quarantine, lockdown, shutdown, stay safe, mask mandate, curfew, etc.* were all used in different contexts. Therefore, the researcher thought that a well-rounded English for specific purposes (ESP) course on epidemiology and COVID-19 would help generate a science-based response to the pandemic, raise postgraduate students' awareness about COVID-19, help share verified information, and foster research to be undertaken by the participants *(the consequences).* In so doing, students would come to grips better with this

new reality and think of possible ways to manage during the pandemic. The researcher hypothesized that the less uncertainty students have, the better they will be prepared and ready to work through the pandemic.

The purpose of this sequential explanatory mixed-methods study was two-fold:

- To test the impact of an online ESP course on postgraduate university students' content knowledge development regarding epidemiology in general and COVID-19 in particular, using the Edmodo LMS for content delivery, receipt, mastery, and assessment.
- To report students' evaluative feedback regarding Edmodo usage in general, and the online ESP course in particular.

Significance of the Study

Since there has been no specific research study published to date in the literature on the use of learning management systems in ESP to explore postgraduate students' content knowledge regarding epidemiology and COVID-19 worldwide, nor in the Moroccan context, the current study (being unique in purpose and methodology) aims to *fill an empirical gap. As such, the current study will provide empirical evidence* on the potential of learning management systems in delivering ESP courses within a university Biology department. The results of the study will likely contribute to the further design, development, and modification of the delivery modes of ESP courses suggested under the umbrella of Technical English or English for Sciences for postgraduate science students in departments of Biology.

2. LITERATURE REVIEW

2.1. Language education from an ESP perspective

Designed based on learners' needs analysis, ESP teaching in the non-English department of postgraduate education is regarded as one of the best ways to get EFL learners to develop their language proficiency and content knowledge (Iswati, 2021). Research tells that the need to focus on the learner reshaped the landscape of ESP into a true enterprise directed towards language education, training, and practice, taking students' areas of interest, language preferences, and pedagogical orientations significantly into account (Johns & Nodoushan, 2015; Robinson et al., 2008; Stoyanova, 2021). Previously, Basturkmen (2010) stated the view that ESP was geared towards speeding up the learning process, guiding learners towards a known goal and to achieve preplanned objectives. Otherwise stated, "The emphasis in ESP is on moving from A to B in the most time- and energy-efficient manner can lead to the view that ESP is an essentially practical endeavour" (Basturkmen, 2010). This significantly contrasts with General English Language teaching, which gravitates towards starting out from a definite point to an indefinite one. Based on this line of reasoning, the ESP course is deemed to be more effective than the general English course (Basturkmen, 2010), and that designing specific courses to better meet the needs of the individual has come about purely as a byproduct of the aforementioned build-up thinking in ESP.

2.1.1. From ESP to EST

In general, the literature on ESP strongly suggests that English for Science and Technology (EST) is an approach to language learning and teaching in which learners' motives and needs to learn the language forms the basic criterion for content selection. In their seminal work, commenting on the emergence of English for Science and Technology (EST), Bolitho and Kennedy (1990) pointed out that science and technology-related study streams and jobs has resulted in much more interest and readiness in English for Specific

Purposes (otherwise, termed as *Technical English*) for reasons closely related to their fields of specialization. English for Science and Technology (EST) specifically refers to the English used in academic lectures, technical reports, scientific publications and papers, and also in technical textbooks. EST has developed into an important variety of modern English in many countries on account of the advances made in science and technology, as well as the overall popularity of the English language. EST is oftentimes used to teach content about physical and natural phenomena, as well as their processes, properties, characteristics, laws, and application within productive activities (Li & Li, 2015).

2.2. EST in the digital world

Students who learn via interactive media-based environments show a tendency to achieve better academic outcomes. Social networking sites, blogs, and wikis offer students unprecedented opportunities to create and share content, as well as to interact with others (Hoare, 2007). As has been previously reported in the literature, digital technologies differ in many ways, namely, delivery format from modular instruction to interactive media, and learning management systems such as Moodle, Blackboard, and wikis (Sclater, 2008). The literature on the topic tells that the use of instructional (educational) technology is pervasive in educational endeavors, ranging from pre-K to post-secondary education (Olele & Williams, 2012). The demand for online EST courses to serve the needs of diverse learners has been discussed by numerous authors in the literature, as was thoroughly explored in a prior study by Zechia (2017). Zechia argued that the EST teaching-learning process has largely focused on technical and profession-related terminology, and also in making sense of short reading passages. She declared, however, that things have started to change; that the digital age has recast resources and sources of information, offering improved opportunities for both teachers and students for a more meaningful EST learning experience. The practice of online ESP teaching has been heavily dependent on educational technology during the COVID-19 pandemic (Stoyanova, 2021). Information technology is no longer just a technical means to an end in foreign language teaching, but has facilitated a revolutionary change at the core of foreign language teaching, having brought about fundamental changes to the structure of the foreign language classroom (Hu, 2021).

2.3. Definitional issues

At this point it is worth addressing certain doubts in this area based on five key concepts (constructs) in ESP and instructional (educational) technology; those being *distance learning*, *online education*, *learning management systems*, *Edmodo*, and *Needs Analysis*).

2.3.1. Distance learning (DL)

One of the major topics to be investigated in the current study is *distance education*, also referred to as *distance learning*. Broadly speaking, it refers to a type of education that exonerates students from in-person compulsory class attendance. This form of education has been widely observed in correspondence courses, wherein students communicate, keep in touch with, and most importantly study lectures or lessons via postal mail; all without having to physically attend a school or college.

Distance education is planned learning that normally occurs at a different (distant) location and requires a well-defined system of delivery that includes modified teaching techniques, alternative modes for communication that includes, but is not limited to, various technological tools, as well as alternative administrative and organizational components (Moore & Kearsley, 1996). Previous studies (Nasseh, 1997) have shown that the concept of distance learning came into existence a long time before the development of the Internet

and is said to be as old as education itself. Joining the debate, Yucel (2006) affirmed that the distance learning models, oftentimes administered via CDs, television, letters, or press, have been conducive to and supportive of the teaching-learning process. Today, many things have changed. Owing to the increase of millennials and the dominion of sophisticated technology and the Internet over countless sectors, the education sector has evolved so that distance education is now much more online-oriented (Cicha et al., 2021).

2.3.2. Educational technology and online education

Relating to the literature on the topic, distance learning (other than purely correspondence-based), and distributed learning, or a combination of both, are common models of online education. Based on solid evidence, education technology (abbreviated as *EduTech or EdTech)* is adjudged to be an entrancing blueprint that captivates learners within their current educational programs (Benno, 1998). Previous research (Kukulska-Hulme & Traxler, 2007) has defined online education as any form of learning that capitalizes on LAN, WAN, or the Internet as a vehicle to facilitate the teaching-learning process and the delivery of quality education. Robinson et al. (2008) argued that EduTech is the joint use of sophisticated technology such as virtual platforms, digital apps (applications), and educational theories to assuage and whet learners' appetites for a more meaningful and purposeful e-learning experience. Robinson et al. (2008) contended that "educational technology is the study and ethical practice of facilitating learning," indicating that helping people to learn is the primary and essential purpose of educational technology (p. 15). On this account, online education helps to facilitate a radical shift from the traditional university modus operandi of providing educational instruction in favor of a more smooth, flexible, viable, and open-learning approach. Undoubtedly, digital technology has become a central aspect of today's higher education, inherently affecting all aspects of the student experience. It has also been linked to an increase in behavioral, affective, and cognitive student engagement, the facilitation of which is a central concern to modern-day educators (Bond et al., 2020).

2.3.3. Learning management systems (LMS)

Several studies on learning management systems proclaim that an LMS can improve the academic performance of student's, enhance their motivation and readiness to learn more, and also to track their progress. A key strength of the LMS is that it leverages the Internet to offer online collaborative tools such as blogs, forums, and wikis in order to facilitate student learning outside of the conventional physical classroom. LMS's provide an effective platform for learners to access learning materials and attempt online quizzes, etc. at a time and place that is convenient to them. Frequently implemented within face-to-face learning, blended learning, and also online learning environments, the LMS has been increasingly used by higher education institutions in order to facilitate learning delivery (Bradley, 2021; Chaw & Tang, 2018; Chipps et al., 2015; Islam & Azad, 2015; Walker et al., 2016).

2.3.4. Edmodo

To the layman, Edmodo is a blog that looks like Facebook in appearance; however, experts have a different story to tell. Holland and Muilenburg (2011) described Edmodo as a microblog through which teachers and students can communicate and exchange messages about different classes. It is worth noting that the platform proffers ease of access to lessons, lectures, and notes that can be uploaded, downloaded, and shared via hypertext links by both teachers and students alike (Kongchan, 2008). Universally, there is consensus that using Edmodo can facilitate the learning process when class time availability is limited.

This platform is widely acknowledged to focus learners on L2 learning, to ask questions, provide responses/answers, correct peer errors, make comments, and even share knowledge anywhere and at any time online (Crowe & MacDonald, 2013). Differently stated, Edmodo is a learning management system that is open source and can be accessed free of charge by anyone located anywhere. Edmodo can be deployed by end-users to meet the teaching-learning process needs and wishes of both teachers and students (Asfar & Asfar, 2021; Paker & Doğan, 2021; Safdari, 2021). Globally, the platform has easily found its way to the heart of millions of teachers and learners for several reasons, which will be detailed further later on in the current study.

2.4. Needs analysis

A series of recent studies have indicated that Needs Analysis is simply a data-gathering tool used by curriculum designers. Experts in the field of ESP stress the importance of conducting rigorous needs analysis prior to designing a course, producing a syllabus, and starting instruction in ESP (Hutchinson et al., 1987). It is used to collect subjective and objective information to develop a curriculum that satisfies the stakeholders: teachers, administrations, students, and even parents. Dudley-Evans and St John (1998) referred to Needs Analysis as "interdependent overlapping activities in a cyclical progress". Another study (Richards & Schmidt, 2002) disclosed that Needs Analysis is: "the process of determining the needs for which a learner or group of learners requires a language and arranging the needs according to priorities" (pp. 353). Holding the same view, Isani (2013) asserted that Needs Analysis is, and should be, the first step in any ESP course development. Kessler (2018) pronounced that teaching technical/scientific English to language learners at the university level should meet the needs and requirements of a specific group of students, be centered on the development of advanced language skills, the competencies that future graduates may require, or other specialist needs. In so doing, learners will benefit from an individualized learning experience that is largely tailored to their specific learning styles and multiple intelligences, which will ultimately help promote their content and linguistic development (Iswati & Triastuti, 2021).

2.5. Study frameworks

2.5.1. Theoretical framework

Based on an extensive review of the literature, the researcher purposefully hand-picked Communal Constructivism as the theoretical framework of the current study. Holmes et al. (2001) envisioned communal constructivism as a model of learning, wherein learners build and contribute their knowledge grounded in experience and interaction with others, and thereby create a communal knowledgebase. Holmes et al. (2006) suggested that the onset of sophisticated educational technologies and social networking sites vindicate a new approach to learning, nominating "communal constructivism." Endorsing the Communal Constructivism theory, the authors of the current study concur that the theory in question affords learners the scope and space for knowledge building, sharing, and collaboration, whilst bringing into play information and communication technologies (ICTs). See Figure 1 for a visualization of the building blocks that form the Communal Constructivism theory.

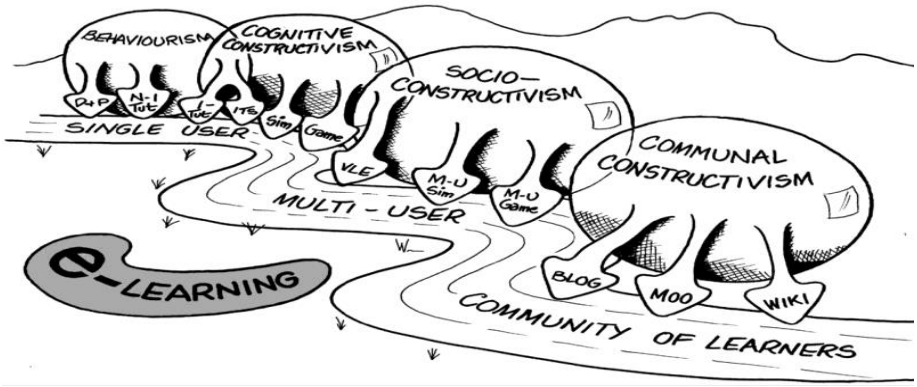


Figure 1. Theoretical framework of the study (Holmes et al., 2006)

To illustrate, Figure 1 presents a taxonomy of the learning/e-learning journey. With regards to behaviorism, the focus is maintained on the learner as a single user throughout various tactics being employed such as Drill and practice (D & P), Simple non-interactive tutorials (N-I Tut), and Cognitive constructivism. However, it is also considered to sharpen the learner as a singular user, too, by bringing into play a set of tactics, mainly Interactive tutorials (I-Tut), Intelligent tutoring systems (ITS), Simulations (Sim), and Games (Game). In contrast, the focus in social constructivism is on learners as multi-users via Virtual learning environments, Multi-user variants of simulations (music) and games Weblogs (blog). Taking the matter further, communal constructivism regards learners as a community immersed in active learning through blogs, Multi-user object-oriented systems (MOO), and Multi-editor wiki systems (wiki). A large number of existing studies in the broader literature on constructivism avow that Vygotsky's constructivist learning theory intently focused on the role of speech in scaffolding learning at the expense of the role of technologies available even at that point. Nowadays, communication is more digitally oriented, invoking trailblazing technologies such Virtual Worlds MOOCs, MUDS, e-mail, discussion boards, and chatrooms (Holmes et al., 2001). As shown, Holmes's "Communal Constructivism" transcends Vygotsky's "social constructivism" in that it facilitates the added value that ICTs (virtual platforms, learning management systems, MOOCs, and wikis, etc.) offer the learning and teaching environment.

2.5.2. Conceptual framework

Getting a perspective on students' needs from the online ESP course on epidemiology and COVID-19 informally through Needs Analysis. The researcher generated a conceptual framework (depicted in Figure 2), which delineates the researcher's understanding, respecting the study variables, and points of intersection. Thus, it identifies the variables required in the research investigation. This conceptual framework serves as a "map" in pursuing the investigation. Notice that the variables of the study are explicit in the paradigm presented in Figure 1. As illustrated in Figure 2, there are two variables; the Independent Variable (**IV**), in this case the ESP online course via Edmodo, and the Dependent Variable (**DV**), which is the students' content development regarding COVID-19 (with eight topics). The current study aims to show that exposure to an 8-week online ESP course, organized around the epidemiology and coronavirus pandemic, could improve students' content knowledge regarding COVID-19, and to ensure that students are able to respond to the pandemic more adeptly.

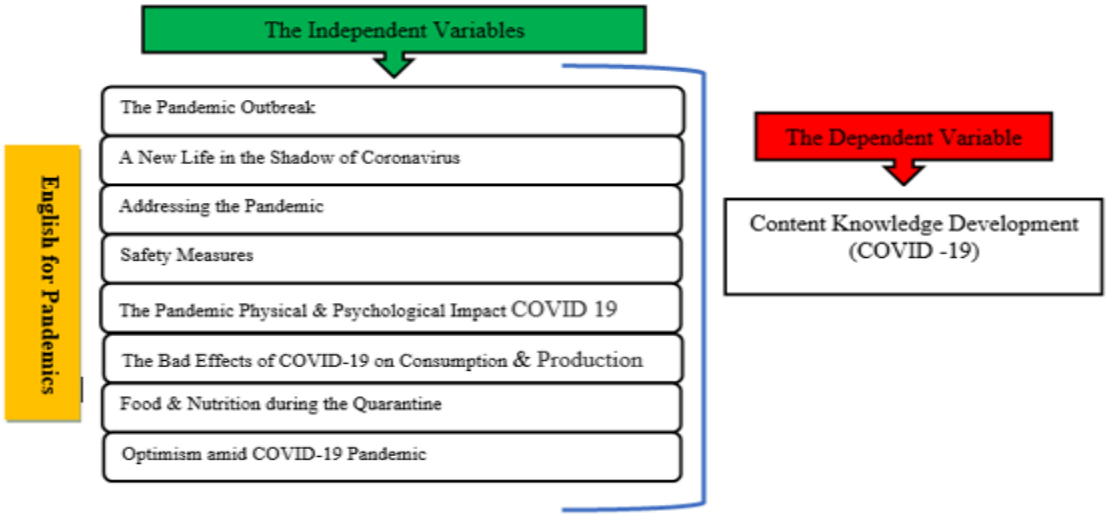


Figure 2. Conceptual framework

3. METHODOLOGY

Having demarcated the study boundaries, narrowed down the field of vision, and limited the scope of the study, the previous theoretical and conceptual frameworks sketched out the research itinerary and grounded the study in theoretical constructs. On this line of reasoning, the researcher came to the conclusion that a sequential explanatory mixed-methods study design would help achieve the purposes of the research and to reach answers to the research questions.

3.1. Research Design of the Study

In terms of design selection criteria, the explanatory sequential design was chosen because it offers the possibility to use a qualitative strand to explain initial quantitative results (Hanson et al., 2005). On the plus side, this design suits the research problem, which is more quantitatively driven. This design offers the possibility to return to participants for the second phase of qualitative data collection and analysis. Figure 3 presents the overall design.

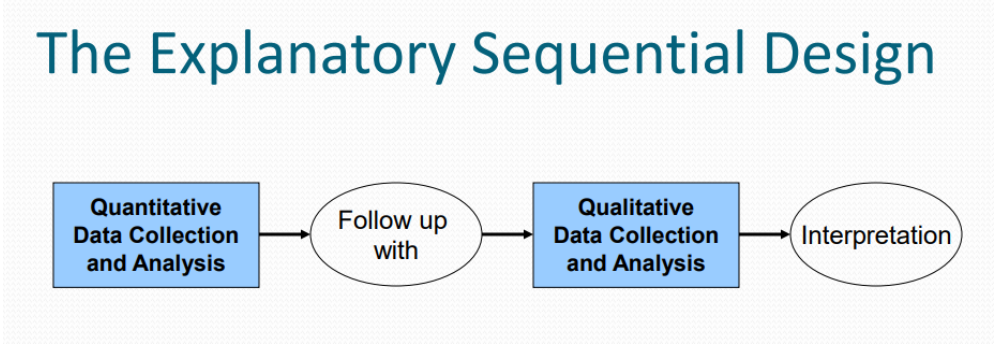


Figure 3. Research study design

Phase 1. *Quantitative (Quasi-experimental design: Online Treatment)*

In the first phase of the study, prior to the intervention, the participants were assessed with a [valid] pretest covering a wide-ranging scope of epidemiology-related topics. This phase aimed at identifying whether or not significant increases occurred over time in the participant postgraduate university students' *content knowledge development* (dependent variable) when utilizing *the Edmodo platform* (independent variable) within an ESP course. The following quantitative research question was formed in order to test the impact of the

treatment on the participants through careful consideration of their pretest and posttest mean scores:

RQ1: Will the students' content knowledge regarding epidemiology and COVID-19 improve following the ESP online course delivered via Edmodo?

Additionally, the following two hypotheses were formed:

H^1 The students' content knowledge regarding COVID-1 pretest mean scores will significantly differ prior to the online intervention.

H^2 The students' content knowledge regarding COVID-1 posttest mean scores will significantly differ following the online intervention.

Phase 2. *Qualitative (Survey: Focus-group Synchronous Interviews)*

With reference to the second phase, qualitative data was collected from the participants via online focus group interviews owing to the pandemic and the impossibility to meet with the target participants for face-to-face interviews. Following the treatment, the participant students were interviewed so that they could voice their evaluative feedback regarding their learning experience. The researcher sought qualitative [evaluative] feedback from the participants regarding the ESP course based on their content knowledge development regarding COVID-19, and whether or not the participants would be willing to repeat such an online learning method (via an LMS) in future learning experiences.

To investigate and explore the students' perceptions of, needs from, and attitudes to the online ESP course, the researcher posed two qualitative research questions:

RQ2: To what extent do students feel that the online course contributed to the development of their content knowledge about and COVID-19?

RQ3: What are the students' attitudes towards the utilization of Edmodo in an online ESP class?

3.2. Background of participants and study context

The participants (*N* = 20, nine males and 11 females) were all enrolled in the first-year of the (SAB) Bio-Products and Food Sciences Master's Degree Program (2018-2020) offered by the Faculty of Sciences' Department of Biology at Moulay Ismail University, located in the Kingdom of Morocco.

3.3. Instruments and procedures

Regarding the first phase, in certain contexts, researchers ask questions that require the observation of a single group as in the recent study context. Therefore, the researcher singled out a specific type of one-group experiments in order to form a one-group pretest-posttest design. This research design allowed the researcher to the participants' measure scores before and after the treatment, and then to compare the difference between two sets of obtained scores.



Figure 4. One-group, pretest–posttest, quasi-experimental

During the COVID-19 pandemic, home-based video conferencing has become increasingly popular among developmental researchers. Online interviews via Skype and

Zoom are now considered the new generation of the online synchronous interview in qualitative research (Su & Ceci, 2021). Concerning the second phase, since it was difficult to conduct *interviews* (amid the pandemic) within a typical face-to-face environment between the researcher and participants as a means to transferring information to the interviewer, focus group interviews (held via Zoom) were employed for various reasons. Today, technology has become increasingly and widely used for the gathering of research data as the more efficient and economical option for different types of qualitative research (Gray et al., 2020). Focus group interviews held via Zoom succor triumphing over research encumbrances such as financial outlay and geographical barriers that may stand in the way of conducting face-to-face interviews, and thereby increases the chances of administering informed synchronous interviews (Ratislavová & Ratislav, 2014).

3.4. Operationalization of the "English for pandemics" online course

The Technological Pedagogical and Content Knowledge (TPACK) approach has been significantly discussed in the literature. Plumley (2010) contended that TPACK allows for the usage of ICT technology's affordances in designing a quality learning experience and the preparation of customized teaching materials. On this basis, the TPACK framework was utilized so as to operationalize the ESP course, and also to outline how its content (what is being taught) and pedagogy (how the teacher imparts that content) must form the foundation for any effective Ed-Tech integration (Archambault & Barnett, 2010).

There is solid evidence that e-learning through Learning Management Systems (LMS's) such as Edmodo, Seesaw, Schoology, Moodle, and Google Classroom, etc., can offer significant advantages in today's classroom (Flavian et al., 2009). Literature on the topic reveals that Edmodo, when coupled with the Technological Pedagogical and Content Knowledge approach, can make learning experiences more enjoyable, more meaningful, and more purposeful (Asfar & Asfar, 2021; Holland & Muilenburg, 2011; Paker & Doğan, 2021; Safdari, 2021). The authors of the current study propounded that the attractive features of the Edmodo platform are very conducive to and supportive of any online language learning experience.

Regarding the selection of the ESP online course materials, the researcher abided by certain established criteria in designing the online ESP course, titled which was "English for Pandemics" (Dudley-Evans, 1998; Iswati & Triastuti, 2021; Pardayevna et al., 2021; Stoyanova, 2021; Vičič, 2011). These criteria are 1) Adequacy, 2) Motivation, 3) Sequence, 4) Diversity, and 5) Acceptability.

As such, the online "English for Pandemics" course was organized around eight units, and aimed at enabling postgraduate university students to realize a deep understanding of COVID-19 from both multidisciplinary and a linguistic perspectives. The course is classed as miscellaneous, and includes the use of worksheets concerning different language skills, grammar drills, conversations, vocabulary work, and video activities. The course is both varied and rich in content, and offers learners various tasks as practice opportunities. The Edmodo LMS was selected as the medium used to teach the ESP online course.

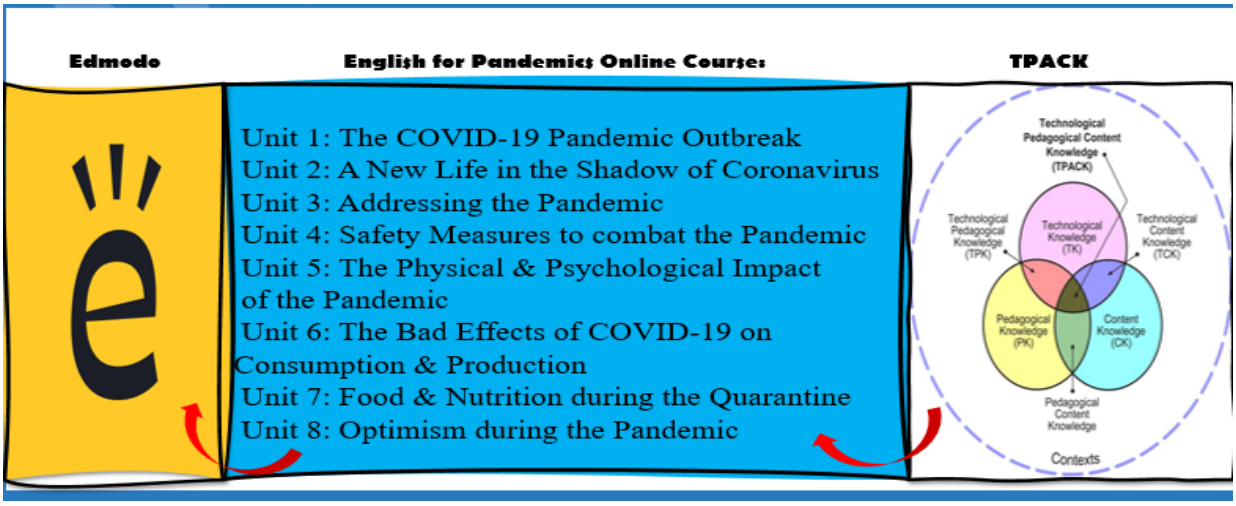


Figure 5. Operationalization of the "English for Pandemics" online Course

In Figure 6, two screenshots are presented from the online ESP course, "English for pandemics" facilitated through the Edmodo LMS.

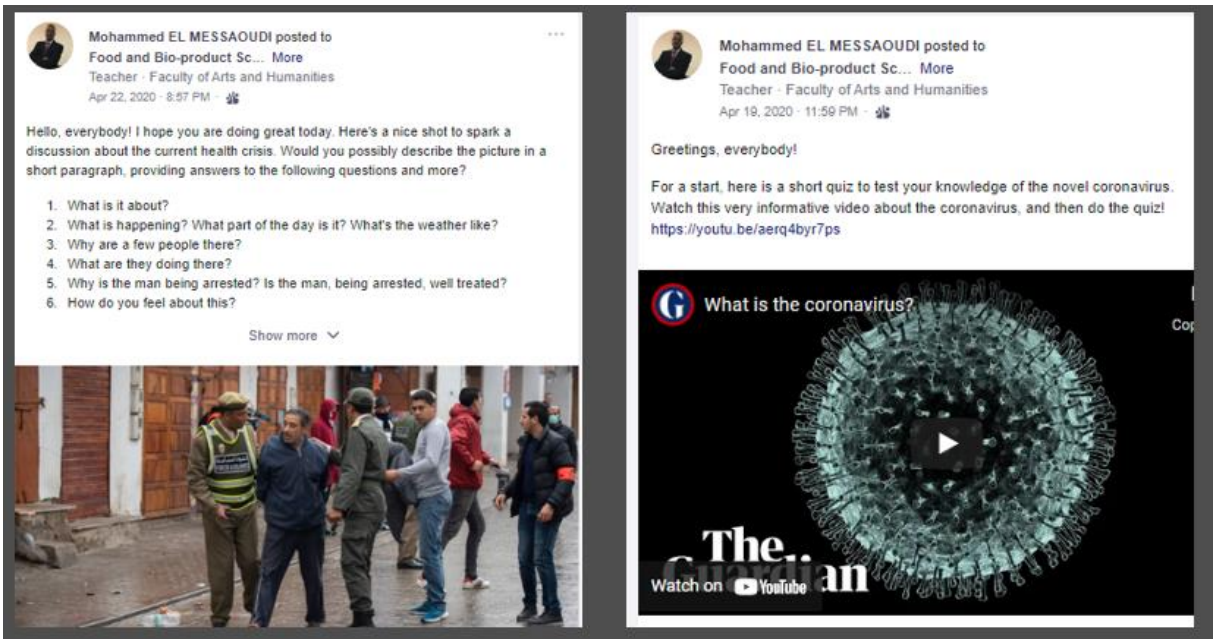


Figure 6a. Screenshot from online ESP course facilitated through Edmodo

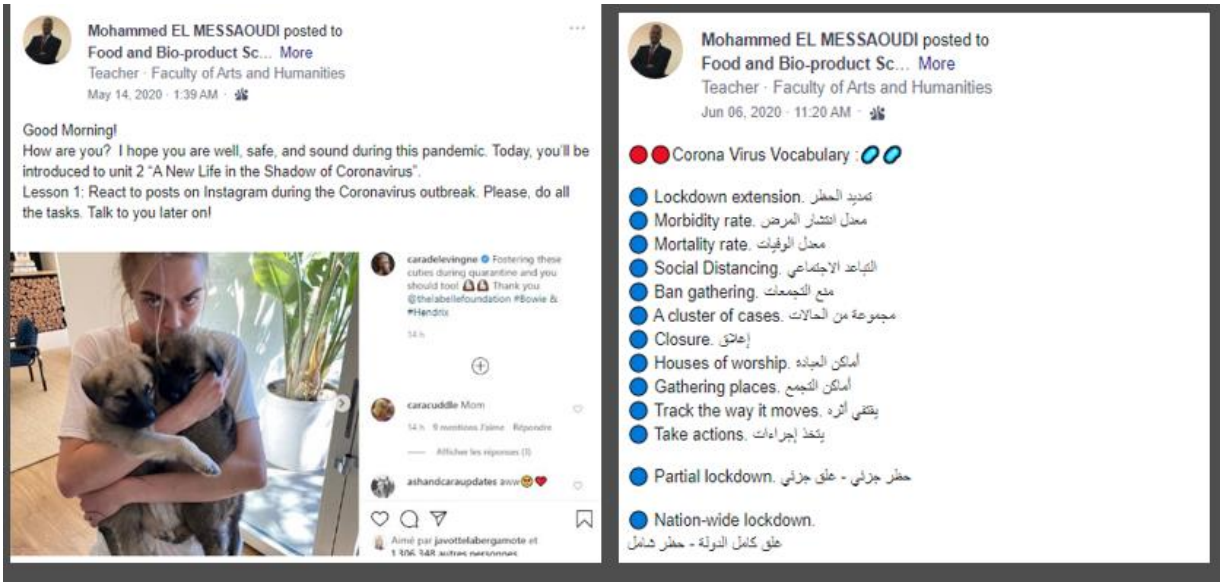


Figure 6b. Screenshot from online ESP course facilitated through Edmodo
Source: https://new.edmodo.com/groups/food-and-bio-product-sciences-34454794

3.5. Data analysis

The quantitative data collected prior to and following the intervention were analyzed using IBM's SPSS (Version 25). Initially, the qualitative data obtained from the online focus-group synchronous interviews was managed using NVivo 12 pro, and was used to transcribe the interviews and to keep track of the speakers so as to understand who said what and in what order and context. However, the process did not go as planned due to the limited number of participants, and also the structured nature of the interview based on predefined questions (see Appendix 1). Therefore, the interviews in fact generated very little data. In order to address this reality (dearth of qualitative data), the limited data was re-analyzed according to the principles of manual coding. The researcher resorted to thematic analysis for the purpose of making sense of what each interviewee had said, focusing on the key points that were raised and perspectives given, as well as where ideas differed and points of commonality suggested. This approach helped to gain broad understanding of the themes inherent in the data, and to then drill down into the material for a deeper analysis. Emergent themes were displayed using various qualitative data display techniques such as letterboxing, Icons Beside Descriptions, and Response (Harding & Whitehead, 2013).

4. RESULTS

To reiterate, the first phase of the study was geared towards answering the following question:

RQ1: Will the students' content knowledge regarding epidemiology and COVID-19 improve following the ESP online course delivered via Edmodo?

This central question was addressed quantitatively using both descriptive and inferential statistics. Table 1 and Table 2 illustrate that the online ESP course positively impacted on the participant students' content knowledge development regarding COVID-19. To describe the basic features of the collected data, descriptive statistics were used so as to provide simple summaries about the sample and the applied measures. From Table 1, it can be seen that the Mean of the posttest scores was 16.80, which is higher than the same measure for the pretest scores which was 14.40. The pretest scores also presented a larger dispersion of scores, as shown by the standard deviation of 2.48 compared to the posttest score of 1.64.

Table 1. Descriptive statistics

	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
pretest	20	8.00	10.00	18.00	288.00	14.4000	2.47939	6.147
posttest	20	6.00	12.00	18.00	336.00	16.8000	1.64157	2.695
Valid N (listwise)	20							

Histograms and the Shapiro Wilk normality test were used to check for the normality of the data. The data was shown to be negatively skewed. Since the data was not normally distributed to meet the assumptions of a parametric test. The Wilcoxon signed-rank was employed so as to quantitatively investigate the existence of any significant changes in scores between the pretest and posttest scores. This nonparametric test is equivalent to the dependent *t*-test.

Table 2. Wilcoxon signed-rank test

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
After - Before	Negative Ranks	0[a]	.00	.00
	Positive Ranks	14[b]	7.50	105.00
	Ties	6[c]		
	Total	20		

a. After < Before
b. After > Before
c. After = Before

Test Statistics[a]

	After - Before
Z	-3.376[b]
Asymp. Sig. (2-tailed)	.001

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Asymp Sig. (2 tailed) 0.001 < 0.05

Based on the Output Test Statistics shown in Table 2, as in the value of the Asymp sig. (2 tailed) .001 < .05, it can be concluded that differences were found in the postgraduate students' content knowledge about COVID-19 and epidemiology prior to and following the English for Pandemics online ESP course. Thus, it may be concluded that the course helped to improve the students' content knowledge regarding epidemiology and COVID-19. These results show the existence of a statistically significant difference between the group scores.

H^1 The students' content knowledge regarding COVID-1 pretest mean scores will significantly differ prior to the online intervention.

According to the rules of the decision of testing, hypothesis H^1 is rejected, confirming that the course had an impact on improving the postgraduate university students' content knowledge regarding epidemiology and COVID-19. Relating to the Wilcoxon signed-rank test, 14 of the 20 participant students had positive ranks, meaning that two-thirds of the participants reaped maximum benefit from the Edmodo administered online ESP course.

The second phase aimed at eliciting qualitative data (evaluative feedback) from the participants.

RQ2: To what extent do students feel that the online course contributed to the development of their content knowledge about and COVID-19?

This second research question of the study was approached qualitatively. Online focus group interviews were conducted so as to double-check and cross-validate the aforementioned quantitative findings. The interviewees emphasized that the online ESP course immensely helped them in improving their English language proficiency in general, as well as their vocabulary knowledge regarding epidemiology in a more specific way. The majority of the participant students highlighted that the online ESP course helped them to improve their content and vocabulary knowledge regarding COVID-19 and the pandemic. The Edmodo platform progress check overview served as a piece of evidence in this regard.

As post-course feedback to the online ESP course facilitated through Edmodo, the interviewees stated that the ESP online course was very interesting, and the majority asserted that they reaped numerous benefits from the English for Pandemics course They reaffirmed that the online ESP course, especially Units 1-4 helped them to gain significant insight into the human body's immune system defense mechanism, the origin of the pandemic, myths about the pandemic, the nature of the novel coronavirus, contagion rates, the different safety measures to be taken to avoid viral infection, the history of sanitizers, and the quarantine lexicon. They also emphasized that Units 5-8, which formed the latter half of the course, were perceived to be the most interesting. Besides being clearly discipline-related, the participants stated that the course units that addressed *Safety Measures to Combat the Pandemic*, *Physical and Psychological Impact of the Pandemic*, *Bad Effects of COVID-19 on Consumption and Production, Food & Nutrition During the Quarantine*, and *Optimism amid the Pandemic* were seen as very insightful, offering more tips and pointers on how to survive the pandemic, and to lead a regular life in what was termed the "new normal."

The third research question of the study was addressed qualitatively, using thematic analysis (see Figure 7).

RQ3: What are the students' attitudes towards the utilization of Edmodo in an online ESP class?



Figure 7. Students' post-course feedback (on Edmodo features)

Technically speaking, the participants declared the Edmodo platform to be user-friendly, *simple* to use, and *functional*, allowing *controlled* access to the course contents, room for learning as a *community*, and for receiving *feedback* on their performance and progress. The following are some narratives, illustrated through the qualitative data display technique, Icons Beside Descriptions and Response (Emery, 2014).



Clara Simplicity: *It is very easy for me to create and set up an account on Edmodo. It does not require any involved steps, just a few clicks. I had no trouble accessing various files and documents. I think that the platform is simple and user-friendly and is much like Facebook. I really liked using it.*

David Functionality: *Based on my experience with the desktop version, the platform seemed very reliable and safe. It is easy to track assignments, homework, and grades, and to receive and make comments. You get reminders too. The tools are great.*

Emily Community: *The platform helped us to learn as a community. We worked as a team towards achieving a common goal, which was to learn in English about COVID-19. It seems a very good way for students to communicate with their teachers and vice versa.*

Kevin Control: *It was pretty easy and simple to gain access to the course materials using a special code. The professor created a closed, monitored group for us to join. Once we were in the group, the professor set the course expectations and norms. It was similar to being at school in a classroom.*

Peter Feedback: *For me, it was a simple way to learn. What I liked about this platform was the real-time feedback on my quizzes and tests. Learning this way was enjoyable. The professor used to send us wake-up calls and messages to those lagging. I also liked the Quiz feature.*

It is also worth noting here that the vast majority of the participant students (82%) demonstrated their willingness to join another online ESP course through Edmodo in the future.

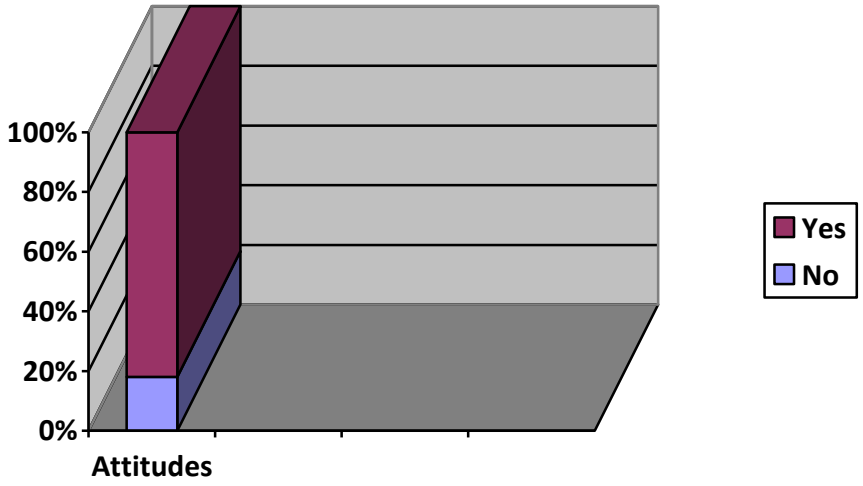


Figure 8. Students' attitudes towards online learning via Edmodo

Interestingly, a minority of students (18%), offered eye-opening feedback on the pitfalls of the online ESP course. Much of the criticism centered around technical issues and experiences, such as features missing from the mobile version of the platform. Figure 9 presents excerpts from the participants' feedback regarding the online ESP course in terms of its shortcomings and their recommendations for its improvement, illustrated through the qualitative data display technique known as Letterboxing.

Pierre: I think the platform is great. What is missing is face-to-face interaction. I hope Edmodo adds video-conferencing technologies such as Zoom or Google meet. This would help a lot.	**Carmen**: Based on my experience with the platform, I would like to say that the mobile version is not as good as the web version. I had some technical problems with the mobile version. It is not stable and shows fewer contents.
	Susanne: There should a chat option to allow students to chat directly.

Figure 9. Students' recommendations for course improvement

5. DISCUSSION

In this study, the Edmodo platform was employed to deliver an online ESP course, titled "English for Pandemics." The researcher utilized the Technological Pedagogical and Content Knowledge (TPACK) framework in order to operationalize the 8-week online course.

Regarding the first phase of the study, the findings found clear support and evidence for the TPACK approach coupled with Edmodo to improve postgraduate university students' content knowledge about epidemiology and COVID-19. The study results offer significant similarity to a very recent study regarding the integration of the TPACK framework with Edmodo titled, "Using Edmodo as a Social Platform to teach EFL Writing for Preparatory School Students" by Paker and Doğan (2021). The study revealed that the participants highly favored using Edmodo for their EFL writing classes and found it to be both very useful and

enjoyable. They also pointed out that using Edmodo interactively helped them to develop their writing skills. The current study's basic findings are also seen as consistent with a very recent piece of research by Sefriani et al. (2021), titled "Blended learning with Edmodo: The effectiveness of statistical learning during the COVID-19 pandemic," which showed that the use of Edmodo's blended learning model proved effective as a virtual learning solution for Information Technology Education students during the COVID-19 pandemic. The current study's results are also well aligned with the findings of Ngo and Ngadiman (2019), whose study titled "The Impacts of Edmodo on Students' Performance in ESP Classrooms" indicated a positive and strong impact on students' academic achievement after having used Edmodo, and the more the students engaged in their learning via Edmodo, the better their scores. The study also verified that the traditional learning environment supported by Edmodo can enable students to learn and practice more, which in turn can increase their level of academic achievement.

Following the intervention applied in the current study, the participant students' (evaluative feedback) opinions and attitudes on the use of Edmodo were obtained in order to determine the effectiveness and potential of using Edmodo in ESP-based education. Accordingly, it was seen that most of the students voiced positive views regarding the use of Edmodo in their ESP learning journey. The study's findings are also notably in significant accord with the outcomes of an earlier study by Balasubramanian and Fukey (2014) titled "Student preference towards the use of Edmodo as a learning platform to create responsible learning environment." Their study reportedly found that students considered Edmodo to be a wonderful and user-friendly social learning platform that enabled them to enjoy studying within an online class. The participants in their study stated that online social networking sites such as Edmodo were great ICT tools with regards to building up knowledge, the sharing of tasks, collaborative working, and for communal learning. The results obtained from the analysis of the focus group interviews in the current study affirmed that Edmodo was regarded as an effective tool for use in online ESP courses. These findings also correlate with a very recent study by Agustiani et al. (2021), titled "Students' learning motivation through Edmodo: Blended learning in the ESP classroom," in which students were found to be instrumentally motivated to learn more English in their future courses via Edmodo.

To recap, the combined conclusions of the current study's qualitative and quantitative findings imply that Edmodo is a communal constructivist environment par excellence. The study demonstrated that learning management systems in general, and Edmodo in particular, can be considered a useful tool to improve postgraduate Biology students' content knowledge regarding epidemiology in general and COVID-19 in particular. These findings are similar to those of a previous experimental study by Végh et al. (2017), titled "The Effects of Using Edmodo in Biology Education on Students' Attitudes Towards Biology and ICT." In their study, Végh et al. (2017) provided empirical evidence on the positive impact of using Edmodo in the classroom and as a facilitative tool to improve comprehension in Hungarian students. In essence, this networked learning philosophy (TPACK, communal constructivism, and Edmodo) adds something else to the learning process, suggesting that "communal constructivism" is a better explanatory framework for online learning. Under the paradigm of communal constructivism, Edmodo is regarded as a convenient arena for networked learning to take place. The results of data analyses of the current study signposted very important findings as to how and why ESP (-networked) online courses may be incorporated at Moroccan universities. In conclusion, the researcher believes that online ESP courses grounded on communal constructivism and facilitated

through Edmodo can generate a learner-centered, supportive web-based environment for technical English and ESP learners.

6. CONCLUSION

Through quantitative statistical techniques, the current study engendered empirical evidence regarding the significant impact of an online ESP course that was administered via Edmodo to postgraduate university students on their content knowledge regarding epidemiology and COVID-19. The study's findings, which were grounded on qualitative data, substantiated that Edmodo is a highly useful virtual platform owing to its unique features, ranging from its simplicity, functionality, and control to its community angle and capacity for feedback provision. The current study describes Edmodo as an interactive platform that enables users to upload, share website links and an array of digital files not permitted in some other platforms, and facilitates student groups working collaboratively on projects.

The positive perceptions of the students towards Edmodo proved that the platform may be used as an effective supplementary learning tool in an ESP class. In a way quite different from Vygotsky's social constructivism, the current study brought forth strong evidence grounded on TPACK coupled with an LMS (Edmodo) that educational technology can provide instructional scaffolding in language education in general, and through an ESP course in particular.

7. SUGGESTIONS

The findings of the current study are suggested to be of significant value to researchers, policymakers, and educators. It is assumed that the study's findings would help policymakers to develop clearer ideas about how the ever-changing dimensions of educational technology could be best employed to promote the evolving priorities of educators and students alike. The researchers urge policymakers to consider the advantages of e-learning; based on its ability to (1) speed up the teaching and learning process, (2) reduce travel costs, (3) save overall education costs (infrastructure, equipment, books), (4) reach a larger geographical area, and (5) train according to self-reliant learning practices. The study's results may also place educators in a context concerning students' perceptions about, the needs from, and attitudes towards online ESP courses, and also in how they should be methodologically addressed. Finally, the current study may be considered to offer food for thought; chiefly, to ESP course designers and ICT engineers who are interested in the field of online education in general and EST teaching in particular.

Based on the findings of the current study, the broad implication is that there exists an urgent need to change the perspective of considering online learning as an option in teaching and learning. Alternatively, and importantly, the study results provide evidence for policymakers of Moroccan universities to reconsider and vary the educational delivery modes (in-person, online, or blended). Broadly translated, the findings indicate that it is of vital importance to provide support to teachers and students on the correct and best use of digital tools through organized intensive training or orientation sessions held for both teachers and students alike, and to ensure that the use of online applications and platforms does not violate the students' data privacy. The study's results provide the basis for new standards to be set, appropriate pedagogies to be employed, and clear objectives set for online education programs based on a comprehensive needs analysis that involves all relevant stakeholders. Overall, the results of the current study demonstrate a strong exigency to develop new assessment instruments that move beyond current standardized test scores as a way to examine the impact of computer-based tools on student learning and

behaviors, ensuring free access to the Internet and ICT facilities for both teachers and students. The researcher concluded there being an urgent need to grant more value and credibility to online degrees and certificates (digital badges) so as to reap more benefits from e-learning and online ESP education.

LIMITATIONS AND FUTURE RESEARCH

No academic work is perfect, hence the current study includes certain limitations. For one, a major limitation emanates from the study design and the lack of either a control or comparison group. Another limitation is based on the study context and instruments. The study capitalized on a specific LMS, Edmodo, which was applied at a particular university (Faculty of Sciences at the University of Moulay Ismail, in Meknes, Kingdom of Morocco). Different LMS platforms such as Schoolgy, TalentLMS Canvas, or OpendEdu, etc., could be alternatively used in different settings as a means to generate additional and perhaps different results. The issue of the representativeness of the sample selected and the generalizability of its findings should be taken into account. Taking the matter further, the study opted for online learning as opposed to blended learning, which utilizes both face-to-face and online learning. This form of e-learning might also affect how learners and lecturers use the LMS at hand. Furthermore, the Edmodo LMS is just an online platform, a vehicle used for the delivery (and storage) of academic teaching and learning content. Future research could enlarge the scale of the research and examine other differences based on additional or alternative variables such as students' gender, department of study, and with other stakeholder groups. Future research could more strategically examine and target new sites of research and deploy new research instruments. Future investigations are also deemed necessary in order to validate the conclusions drawn from the current study.

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Appendix I. Interview Questions

1. How do you evaluate the Edmodo platform in terms of accessibility (logging in and logging out), delivery (viewing and downloading files), interaction (receiving and replying to alerts and notifications), collaboration (between the teacher and students), and assessment (online quizzes)?
2. In what ways do you think that the ESP online course has contributed to improving your content knowledge about COVID-19? Please, explain!
3. In your opinion, which course units are the most interesting? Which ones are the least interesting?
4. Would you like to try a new online ESP course via Edmodo in the future? Why? Why not?
5. What are the shortcomings (points of weakness) of the online ESP course?
6. If this course (COVID-19) is to be implemented again, would you provide some suggestions to improve the (8) course units?

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