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Communication Processes in Virtual Learning Environments and their Impact on Online Lifelong Learning

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Abstract

Completing a regulated education in a specific area is no guarantee of getting a job or, for that matter, of achieving job security. In view of this situation, adults choose to carry on learning. This article analyses participation in higher-education lifelong learning courses entirely undertaken in virtual learning environments (VLEs). The aim is to establish which aspects of the communication process add quality to online courses. The sample consists of four lifelong learning courses published on WebCT for graduates in general and teachers/lecturers at various educational levels in particular, whose goal is to further their academic training in order to specialise in a specific field. The research combines both qualitative and quantitative approaches. Two main tools were used to gather data: the WebCT "Track Students" tool and the communication tool. The results show that quality in the communication processes of online courses has a direct impact on student participation in online teaching-learning processes. Dealing with students in a personalised manner, designing

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communication tools that take account of the needs of academic disciplines and of users, offering a variety of discussion topics, coordinating them and directing them in a responsible, effective manner, and offering quick, smooth interaction are some of the intervening variables.

Keywords
lifelong learning, communication, virtual learning environments

Procesos de comunicación a través de entornos virtuales y su incidencia en la formación permanente en red

Resumen

Finalizar la enseñanza reglada en un área específica no garantiza conseguir un puesto de trabajo ni, por supuesto, la estabilidad laboral. Ante esta situación, los adultos optan por seguir estudiando. Esta investigación pretende analizar la participación en cursos de formación permanente universitaria desarrollados íntegramente en entornos virtuales de aprendizaje. Pretendemos esclarecer qué aspectos del proceso de comunicación dan calidad a nuestros cursos virtuales. La muestra está formada por cuatro cursos de formación permanente publicados en WebCT y destinados a graduados, especialmente a docentes de distintos niveles educativos, cuyo objetivo sea continuar su formación académica y conseguir la especialización. Se basa en un diseño mixto desarrollado desde una perspectiva cualitativa y cuantitativa. Los instrumentos con los que se han recogido los datos han sido principalmente la herramienta de «Seguimiento de alumnos» y la herramienta de comunicación de WebCT. Los resultados obtenidos indican que la calidad en los procesos de comunicación de los cursos virtuales repercute directamente en la participación que tienen los estudiantes en el proceso de enseñanza-aprendizaje en red. Atender a los alumnos de forma personalizada, diseñar las herramientas de comunicación pensando en las necesidades de la disciplina y de los usuarios, ofrecer variedad de temas de discusión, coordinarlos y dirigirlos de manera responsable y eficaz u ofrecer una interacción rápida y fluida son algunas de las variables intervinientes.

Palabras clave
formación permanente, comunicación, entornos virtuales

1. Higher-Education Lifelong Learning in the Knowledge Society

Paul Belanger, the director of the UNESCO Institute, considers that lifelong learning became especially important in the 1970s as a result of economic growth and a rise in confidence levels. Since then, lifelong learning has been a pivotal feature of UNESCO and OECD (Organization for Economic Cooperation and Development) initiatives (Requejo Osorio, 2003, page 28).

In the European context, reference should be made to the Bologna Declaration (1999), which laid the foundations for the unified development of the European Higher Education Area (EHEA) by 2010. The need to increase the clarity and transparency of higher-education studies, to offer attractive educational programmes and to improve competition in education were some of the drivers of the Bologna Declaration. Its main purpose is to achieve a Europe of knowledge, which is considered crucial to social development and citizen training. Lifelong learning within the Bologna Declaration framework is enhanced by aspects such as student and teacher/lecturer mobility, inclusion in the European labour market, international competition and obtaining recognised accreditation and qualifications outside the higher-education system.

Given the labour mobility and instability experienced by most Spanish citizens, lifelong learning has become an educational alternative that helps them find work and adapt to new jobs. In short, completing a regulated education in a specific area is no guarantee of getting a job or, for that matter, of achieving job security. In view of this situation, adults choose to carry on learning in order to develop their CVs.

2. The Online Learning Process

It is nothing new to assert that information and communication technologies (ICTs), computerisation, telecommunications and micro-electronics have led to innovations in information exchanges and in communication, and have had an impact on the development of innovative initiatives in the sphere of education.

ICTs can be integrated into education from a number of different angles: as an educational resource, an object of study, an administration and/or management medium, and as a research and communication medium. As a communication medium, a characteristic feature of ICTs is their ability to facilitate interaction between teachers/lecturers and students, and between students and educational content. In this context, worthy of note are some aspects that Cabero Almenara pointed out as being the defining features of ICTs: instantaneousness, quality, flexibility, speed, adaptability, diversity, storage capacity and digitalisation.

Disciplines such as psychology, sociology, linguistics, education and engineering have had an impact on the theory of communication. In 2001, M. Rodrigo Alsina presented a classification of the main approaches to the study of communication, of which three are highlighted here:

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Interpretative: the main objective is the study of interpersonal communication, defined as a process that allows meaning to be shared, society to be built and mass communication processes to be strengthened. The media supporting the interpersonal communication process are considered to develop meaning and/or to modify existing meaning. Some of the interpretative approaches are the Palo Alto school, symbolic interactionism, constructivism and ethnomethodology.

Functionalist: an approach that performs mass communication research from an essentially instrumentalist and pragmatic viewpoint, where the function of the receiver is practically cancelled out.

Critical perspective: comprising a set of approaches influenced by Marxism, whose objective of study is 21st-century capitalist society (Frankfurt school, political economy and cultural studies).

Online communication is a medium that integrates educational objectives into technological innovation. An awareness of available media and of their advantages helps those involved in the teaching-learning process to transmit information effectively; in addition, it raises the potential to turn that information into knowledge. This implies not only possessing certain interpersonal skills, but also being aware of the potential that new technologies offer.

A fact worthy of note is the historic impact of the integration of several means of communication on an interactive network; in other words, the formation of hypertext and a metalanguage that, for the first time in history, integrate written, oral and audiovisual means of human communication into one system (Castell, 2008, page 400). Online communication allows us to integrate written messages, images and sound into one system, which facilitates interaction, whether synchronous or asynchronous, from distant points.

The process of online communication through the production of digital messages, whether written and/or multimedia ones, involves a set of phases and competencies. We have taken the communication process established by Rodríguez Illera and Escofet Roig (2008, pages 373-374) as the conceptual framework. The authors consider that the communication process is characterised by three interrelated blocks of competencies: communication competencies, technical competencies (ability to use software applications) and production competencies (ability to produce messages in virtual learning environments). Regarding the phases of the communication process, the authors refer to conception, design, production, transmission, reception, comprehension and response. Textual or multimedia content and a variety of compositions are generated in the production phase. Both elements become part of the communication production process itself, which is characterised by having three main production moments: creation (specific codes and applications), re-use (search and selection) and space-time distribution (unidirectional and interactive messages). On the one hand, production processes require the development of the aforementioned competencies and, on the other, the use of applications that allow them to be carried out, such as searching, editing, composing, programming, publishing and synchronous communication.

As Castell (2008, page 401) asserts, the advent of a new electronic communication system, characterised by its global reach, its integration into all media and its potential for interaction, is changing our culture and will do so forever.

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3. Experiments Undertaken at the National University of Distance Education (UNED) on the Teaching-Learning Process Using WebCT

In 2000, UNED started the process of integrating ICTs into the distance education system. Initially, it exclusively used the WebCT platform as a VLE. Since the 2001-2002 academic year, many research projects have been initiated, whose object of study includes the advances and potential of integrating WebCT into the teaching-learning process.

In 2002, research was carried out on student participation in online courses in Psychology, Hispanic Language Studies and Information Technology. It was found that students often accessed the VLE. However, one of the most noteworthy data was that students on Language Studies courses – the studies having a lower technical level – were the most active participants in subjects: they accessed discussion boards more often, and sent and read more messages. Some of the conclusions highlighted the need to make improvements to the courses, such as renewing the technological resources of associated centres, raising student motivation to get them to take part in courses, enhancing the dissemination process for this type of studies, strengthening collaboration between lecturers and optimising the educational quality of the studies (Santoveña Casal & Tasende Mañá, 2002).

Subsequently, in 2006, research was carried out on the quality of online courses for the Social Education diploma, and the conclusion drawn from it was that in recent years, there had not been adequate progress in terms of the quality of UNED's online courses. The recommendations affected both the support offered to students and the quality of teaching materials (Santoveña Casal, 2006).

In 2006, Malik Liévano and his team carried out a pilot study on the two formats of Psychopedagogy Practice (one requiring presence at a collaborating centre and the other being more flexible), and concluded that their objectives had been attained. Students have learnt to relate to and coordinate with the rest of the group, to handle online tools and to search for information. Students get a really practical education in a VLE.

Finally, we would point out the research carried out by Jordano de la Torre and Varela Méndez in 2006 on student participation in the subject of English, on the Tourism diploma course made available on WebCT. The authors concluded that the most enriching thing about online courses was the communication and cooperation that developed between students, and suggested that the online courses offered should be gradually improved to make them more efficient and motivating.

4. WebCT Platform: General description

WebCT (Course Tools) was originally developed by the University of British Columbia. It is a VLE system for online learning and the publication of interactive courses. Its main features are student tutoring and tracking, and it has a number of different communication, content, assessment and study tools.

* The interaction process via WebCT's communication tools

Communication and interrelation are possible through the use of various synchronous (real-time communication) and asynchronous (communication in a different space-time) tools available on the courses: e-mail, discussion boards and chats.

1. E-mail: this tool is very similar to the one offered by any service provider or to the one on any computer. The fundamental difference between it and other e-mail systems is that it is only available to students on the course. It allows direct, private communication with the rest of the virtual community.

2. Discussion boards: this asynchronous tool is a space for discussing topics connected with the subject or course. For each course, there are several boards; some are created by default and others that are created by subject lecturers.

3. Chats: allow synchronous communication, which facilitates interactive sessions. It is considered to be a very useful tool for students to pose questions to co-students, and to offer answers to questions posed by others.

5. Objectives

This study examines participation in higher-education lifelong learning courses entirely undertaken in VLEs. The main aim is to establish which aspects of the communication process add quality to online courses.

The specific objectives are as follows:

– To study participation and the use that lecturers and students make of communication tools in online lifelong learning courses at UNED published on the WebCT platform.
– To analyse communication tools used, and their use by lecturers on online courses.
– To perform a comparative study between online courses, taking account of recorded participation and the use of communication tools integrated into the courses.
– To analyse the impact of the methodology used for communication tools on student and lecturer participation in online courses.

6. Design and Methodology

6.1. Population/Sample

* Population

The population comprises: lifelong learning courses published on the WebCT platform and made available online by UNED to various public institutions for training teachers; lecturers and tutors of these courses; and students at whom the online training is aimed.

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UNED currently offers 159 courses for the Teacher Training Programme, 57 in the Faculty of Education. The data available on lifelong learning courses published by UNED on the WebCT platform are for 2004 (course type, students and lecturers) and refer to: eight online lifelong learning courses for teachers, and 75 external courses made available online by UNED, belonging to external public institutions.

* Sample

Sample selection was performed on lifelong learning courses made available online by UNED and taught in their entirety via the WebCT platform, irrespective of the fact that some face-to-face information sessions are held.

Course lecturers had to be asked for their permission to carry out the research. It is important to underscore that their permission leads to some constraints on the research: it is not possible to name the course or the institution offering it, or to describe the characteristics of the users or the identity of the people at whom the courses are aimed.

The sample consists of four lifelong learning courses published on WebCT for graduates in any educational cycle in general, and teachers at various educational levels in particular, whose goal is to further their academic training in order to specialise in a specific field: one of the courses is part of the lifelong learning programme at UNED, and the other three are offered by institutions external to the university. Some of their characteristics are described below:

1. Online course 1: a UNED lifelong learning course. Comprising seven subjects.
2. Online course 2: an external continuing education course in social sciences, Institution A. Comprising seven subjects.
3. Online course 3: an external continuing education course in social sciences, Institution B.
4. Online course 4: an external continuing education course in social sciences, Institution C.

The sample comprises the following course users:

- Lecturers: 67: nine on course 1; 23 on course 2; 32 on course 3; three on course 4.
- Tutors: 40: seven on course 1; 16 on course 2; 14 on course 3; three on course 4.
- Students: 2,063: 118 on course 1; 1,713 on course 2; 199 on course 3; 33 on course 4.

6.2. Design

A mixed design based on qualitative (content analysis of messages posted to discussion boards and sent by e-mail) and quantitative methods (descriptive study).

6.3. Information Gathering Techniques/Instruments: Questionnaire

* WebCT "Track Students" tool

Using the "Track Students" tool, the following data were gathered on students and lecturers: the number of times they accessed discussion boards, and the number of messages sent and read.

* Communication tool

Communication tool activity was studied from quantitative and qualitative perspectives.

– Quantitative review: mean number of discussion board messages, and mean number of e-mail messages sent and read.
– Qualitative review of all communication tools used on the courses:
  • Use of discussion boards and e-mail: analysis of tool organisation, interaction and topics covered.
  • Use of chat tool: space-time organisation.

* Data analysis using Excel and SPSS 17

* Content analysis technique

In order to systematise the study of data obtained, some of the steps recommended by García Llamas, González Galán and Ballesteros Velásquez (2001) were followed, albeit with a more qualitative focus: The steps followed were:

1. Objective and systematic reading of interviews.
2. Underscoring the main aspects indicated.
3. Identifying common aspects.
4. Identifying distinguishing aspects.
5. Drawing conclusions.

6.4. Description of Research Phases

The data analysis process was performed gradually throughout the 2006 academic year:

– Analysis of the number of times students and lecturers accessed the online courses, and the number of messages they sent and read.
– Review of communication tools: analysis of communication tool content and organisation.
– Data analysis and conclusion drawing.

7. Results

7.1. Study of Participation in Online Courses

* Access comparison

The total number of times each registered student accessed online courses was 250.6. The online course with the highest recorded mean was online course 1, with a mean of 2,291.1. The means for the rest of the courses were much lower by far. In second place came online course 4, with a mean of 355.6. The mean for online course 3 was 163.3. In last place came online course 2, with a mean of 118.1.

* Comparison of communication tool use

* Student participation

The mean number of messages posted to discussion boards for the four online courses was 2.91, whereas the mean number of messages sent by e-mail was 1.67.

Students on online course 1 used communication tools the most (59.48 messages sent by e-mail and posted to discussion boards per student). There was a clear difference compared with the rest of the students. For these students, the mean number of messages posted to discussion boards was 42.92, and the mean number of messages sent by e-mail was 16.57. Each student read and sent a mean of 1,831.2 messages.

In second place came the students on online courses 3 and 4, both with a mean number of messages posted to discussion boards and sent by e-mail of 1.7. Students on course 3 sent more e-mail messages (a mean of 1.19) than students on course 4 (a mean of 0.6). Regarding students on course 4, it was found that they used discussion boards more (a mean of 42.4 messages) than students on course 3 (a mean of 14.5). In last place came the students on online courses 2, with a mean number of messages posted to discussion boards and sent by e-mail of 0.7. Students on course 2 (mean of 31.48) used discussion boards more than students on online course 3. In short, the results for online courses 2, 3 and 4 show that the use students made of communication tools was minimal.

If the whole sample is taken into account, it can be concluded, in general, that students' communication tool use was very low. In addition, they used discussion boards more than e-mail, and read more messages than they sent.

* Lecturer participation

The mean number of messages posted to discussion boards for the four online courses was 62.35, whereas the mean number of messages sent by e-mail was 434.3.

The course lecturers and tutors with the highest participation were those on online course 1. The mean number of messages they posted to discussion boards (698.3) was higher than the mean number of messages sent by e-mail (256.5), and, taking account of both tools, the mean number was 494.5. There was a clear difference compared with the rest of the online courses. In second place came online course 2, with a mean number of messages posted to discussion boards of 20.78 and a mean number of messages sent by e-mail of 258.3, and, taking account of both tools, the mean number

was 279.1. As can be seen, e-mail was used more often on online course 2 than on online course 1. In third place came online course 3, with a mean number of messages sent by e-mail and posted to discussion boards of 89.1, and a mean number of messages sent by e-mail of 101.7. However, discussion boards were used very little (a mean number of messages posted of 4.3). In last place came online course 4, with a mean number of messages posted to discussion boards and sent by e-mail of 12.67. They posted eight messages a day to discussion boards, and sent 4.6 messages a day by e-mail.

It can be concluded that lecturers' communication tool use was high. On online courses 2, 3 and 4, it was found that lecturers used e-mail more than discussion boards, and on all the courses studied, lecturers read more and participated more often in communication tools than students did.

* All user participation

The mean number of messages sent via communication tools was 4.5. There was a very low mean number of messages sent by e-mail and posted to discussion boards by course users. Online course 1 users participated the most (the mean number of messages was 58.24). Online course 2 had a very low mean of 4.86. In third and last places, respectively, came online course 3 (a mean of 2.03) and 4 (a mean of 1.88).

7.2. Qualitative Study of Communication Tool Use

* Online course 1

In discussion boards, interaction with students began with a welcome message in which the tutors presented the subject. Students replied and thanked them for their clarifications.

Discussion board organisation was customised according to the needs of the subject. All subjects followed the pattern of discussion board organisation that WebCT offers by default: Main and Content. In addition, new boards were created to allow students to pose questions, reflect on discussion topics, relate to each other via non-academic boards, etc. Some of the boards were open throughout the tutoring period; however, in most cases, boards for specific topics or learning units were closed once instruction for their content was complete. As a result, students could carry on reading messages but could not post new ones.

In general, the discussion boards for online course 1 subjects were organised by topics, questions and transcriptions of chat sessions. The cordial tone used by tutors and students was one of the most noteworthy features of the communication process on this course.

E-mail was used less for tutorials than discussion boards and chats were. However, a high level of e-mail activity was found for some of the subjects. The topics dealt with mostly by e-mail were those relating to problems with teaching materials, registration, specific requests, exam problems, technical problems, the job bank, etc. Replies were quick, cordial and friendly. Lecturers replied to students in a very short space of time (no longer than two days).

Chat sessions were held weekly. Each tutor was obliged to convene students once a week. These tutorial sessions coincided with the student support period. In these chat sessions, the questions dealt with were those connected with the topic being studied that week. According to the session records, we found that these chats were organised and structured in a way that allowed quick, smooth interaction. Subsequently, the transcription and summary of everything covered in an online tutorial were posted to discussion boards.

Discussion boards were customised and adapted to the needs of each discipline and of the users. In short, discussion boards were organised as follows:

- Welcome and introduction.
- Café: a discussion board set aside for relaxed communication outside the academic sphere. It stayed open throughout the academic period of tutoring.
- Questions: a discussion board for posing questions. It stayed open throughout the academic period of tutoring.
- News: a board where the tutor could post messages announcing any relevant news or events. A feature of this discussion board was that it was public and closed. In other words, students could read messages but not reply to them.
- Educational unit X: there was a discussion board for each of the educational units forming part of the syllabus. The aim of it was to foster discussion and thought on the content of the educational unit. These discussion boards were closed as and when the instruction for the educational unit was complete. As a result, students could carry on reading messages but could not post new ones.
- Main discussion board: for relevant announcements and news written by the tutor. In other words, it was closed, so students could read messages but not reply to them.

In addition, on online course 1, videoconferences were held throughout the course for each of the subjects forming part of it.

* Online course 2

Interaction between course users began with introduction and welcome messages posted to discussion boards. Interaction between students developed quickly; they all introduced themselves and commented on their experiences of other similar courses that they had taken. These introductions were useful to students that had no previous experience of distance courses via WebCT. The level of collaboration between them was very high.

The pattern of discussion board organisation that WebCT offers by default was followed: Main, Content and All. This tool was used to pose academic and technical questions. Generally speaking, it can be said that tutors replied to students' questions; however, because there was a delay in replying in some cases, communication developed mainly among students. Some of the topics covered were:

– Introduction: all users on the course introduced themselves, posed questions and commented on concerns. They mentioned the province they were from, what line of work they were in, their expectations of the course and the potential difficulties they might come up against. Students with previous experience of similar courses encouraged and guided co-students.

– Questions about exams: the date they were being held, the assessment method, assessment objectives, type of exam, how to look up their grades, how to get a certificate, how to look up co-students' grades, questions that they felt had been wrongly corrected, complaints about their grades, troubles doing the exams, etc.

– Technical questions: the operation of some of the facilities, how to access certain resources, breaks in some links, connection problems that prevented them from taking an exam, how long they had to access to the online course, etc.

– Academic questions: questions about the content of topics presented.

They did not use synchronous tools, such as chats or videoconferencing.

* Online course 3

Generally speaking, it was found that online course 3 users did not often use communication tools. In many cases, participation in discussion boards was initiated by students, and the lecturer subsequently replied to their questions. It was also found that tutors and lecturers use discussion boards and e-mail indiscriminately: they did not distinguish between the most appropriate types of messages for discussion boards (topics of interest to all users) and for e-mail (personal matters). In some of the course subjects, lecturers removed the "Discussion Board" tool, which meant that interrelations between course members were limited to e-mail. This lowered the interaction and communication potential.

In addition, no topics for reflection were introduced on discussion boards. Rather, this tool was generally used only to answer questions and solve specific problems.

Tutors did not offer any guidance on communication tool use, although it is worth noting that students did receive specific technical training before starting a course.

* Online course 4

The pattern of discussion board organisation that WebCT offers by default was followed: Main and Content. No new topic-specific boards or relaxed-communication boards were created.

Interaction between students began via a discussion board. The respective module lecturers introduced themselves, welcomed students and presented the space-time organisation of the programme (exam dates and materials distribution).

Students posed questions about content and assessment tests in discussion boards, and lecturers replied immediately. Lecturers tried to get students to pose more questions about study materials and encouraged them to study for and pass the course. In addition, this space was used to announce content availability, exam dates and topic availability on the course.

Some of the topics covered in discussion boards were:

– Introduction and welcome: one of the lecturers welcomed students and encouraged them to use discussion boards and e-mail. Students introduced themselves and gave their thanks for the welcome greeting.
– Questions about module X: questions about the content of topics presented.
– Page errata: lecturers informed students about mistakes on content pages.
– Questions about exams: the date they were being held, the assessment method, assessment objectives, type of exam, how to look up their grades, how to get a certificate, how to look up co-students' grades, questions that they felt had been wrongly corrected, complaints about their grades, troubles doing the exams, etc.
– Technical questions: how to access and download the exam, connection problems, etc.

E-mail was used for matters such as posing questions and requesting clarifications about content, assessment tests, problems doing an exam/and or technical problems.

8. Conclusions

The study on the number of times students accessed the VLE showed a clear difference between online course 1 and the rest of the courses. The mean number of times each registered student accessed this online course was 2,291.1. In second place came online course 4, with a mean of 355.6; in third place came online course 3, with a mean of 163.6; and in last place came online course 2 with a mean of 118.1. The study performed on communication tool use also showed a significant difference between online course 1 and the rest of the courses, since there were, in fact, inequalities.

Regarding the comparative study of student and lecturer participation in online courses, we are able to assert that students often accessed the courses (the number of times each registered student accessed them being 250.6), but once in the VLE they did not often use communication tools. However, the lecturer sample used communication tools more often. The data are revealing: students posted a mean of 2.91 messages to discussion boards and sent 1.67 messages by e-mail, whereas lecturers posted a mean of 62.35 messages to discussion boards and sent 434.3 messages by e-mail. Therefore, it is clear to see that lecturers used communication tools much more often than students did. It is necessary to analyse why, despite accessing an online course, students decide not to use communication tools. The comparative study of activity recorded on the online courses revealed some interesting data.

The comparative study between the online courses showed, in general, that course users, taking students and lecturers as a whole, sent and posted very few messages by e-mail and to discussion boards. Online course 1 obtained the best results for participation and for communication tool use. It was found that students and lecturers on online course 1 participated the most, and there was a clear difference compared with the rest of the online courses studied.

As already indicated in the data analysis, online course 1 had the highest mean for participation in communication tools (a mean of 494.5 messages read and sent), which contrasts significantly with the results obtained for the rest of the courses: 279.1 on online course 2; 89.21 on online course 3; and 12.67 on online course 4. In short, online course 1 had the highest recorded student and lecturer participation. The qualitative study tells us what the most relevant features of the course were, which may explain the difference between it and the rest of the online courses.

Online course 1 was characterised by the customisation and adaptation of discussion boards to the requirements of the discipline and the needs of users, and offered a wide variety of discussion topics. The qualitative analysis confirmed the high level of involvement that lecturers had in course development. These lecturers interacted more often with students, replied to students' requests more quickly and constantly strengthened student participation. A whole host of discussion topics were coordinated and directed by the lecturers in charge with greater frequency and effectiveness than those on the other three online courses analysed.

Online course 1 made the best use of communication tools. It used all the options that the platform offers: discussion boards, e-mail, chats and videoconferencing. The combination of tools used fostered a richer, more dynamic communication process between course participants. It was found that the rest of the online courses used discussion boards only and, in one case, e-mail only.

Not only did online course 1 record a much higher participation than the rest, but also the qualitative analysis confirmed that greater care was taken over its organisation than the rest. The educational methodology used in online course 1 fostered dialogue and an exchange of information between lecturers and students. The students' commitment and collaborative attitudes were strengthened, and this was reflected in a higher participation in discussion boards, in videoconference attendance, in chat interaction and in e-mail use. Lecturers posed questions and suggested topics for reflection, and managed to achieve a smooth process of synchronous and asynchronous communication. In short, the communication process on online course 1 was optimal. Via discussion boards and e-mail, the online course offered a wide variety of specific educational guidance. Lecturers supported students closely via the different communication tools available, thus allowing them to adapt their service to the students' needs. On the other three online courses, it was clear that these aspects were less developed.

In short, it was found that online course 1 made an integrated use of the different communication tools, while the rest of the courses generally showed very little interaction. The communication methods used did not manage to develop all of the potential that the platform offers. Indeed, there were significant differences between the courses with regard to the process of communication itself. Over the whole academic period, student participation in online course 1 was strengthened via discussion boards, e-mail and chats, and videoconferences were held throughout the course. Courses 2, 3 and 4 made very little use of the potential that communication tools offer (synchronous and asynchronous), did not use discussion boards very often, or chats and videoconferencing at all.

If we take the sample analysed into account, we could conclude that communication tool use was not optimal. In fact, it was found that three of the four courses studied did not often use discussion boards, e-mail, chats and/or videoconferencing. For courses 2, 3 and 4, a poorer educational methodology was used than for online course 1. Specifically, on courses 2 and 3, discussion topics

were suggested and students' questions were answered. On these courses, it was found that lecturers were more active in discussion boards than on online course 4. In general, however, on these three courses it would be advisable to enhance discussion boards with more discussion topics, to follow-up messages in a much more detailed manner and to develop the communication process by using other tools such as videoconferencing and chats. Furthermore, a greater involvement of lecturers in the teaching process would optimise communication tool use and strengthen student participation. There are clear examples of fairly inappropriate initiatives. For example, on online course 3, lecturers had removed the "Discussion Board" tool and only used e-mail, which meant that the smoothness of communication was not assured and that lecturers were overloaded with work. Therefore, on the three online courses 2, 3 and 4, lecturers hardly participated in discussion boards and did not offer any synchronous communication alternatives. A specific methodology to facilitate student participation in discussion boards was not found either. These characteristics could end up having an impact on student motivation and interest when it comes to collaborating on an online course.

The low student participation in communication tools is due, it would seem, to a poor or inappropriate use of discussion boards and e-mail. The fact that e-mail was used for general-interest matters, as was the case for online course 3, hindered communication between users. The exclusive use of e-mail severely limited the potential for communication among the group. E-mail is mainly for private communication, and for general-interest topics it is considered essential to use a tool such as a discussion board to enable group participation. In addition, the lack of reflection and discussion board topics in many cases caused students to use discussion boards to pose questions solely about practices (exams, problems accessing materials, grades, certificates, etc.), rather than fostering collaboration and interaction between them. Consequently, it can be concluded that hiding discussion board or e-mail tools hinders interaction and smooth communication between those involved in the teaching-learning process. In addition, on most of the courses the chat tool was not used, which lessens the educational quality of the environments.

In short, the data confirmed that online course 1 obtained the best results of all the courses in the study, both qualitatively and quantitatively, for communication-tool activity and platform-access activity. The main conclusion that we can draw from this study is that the educational methodology used in the communication process has an impact on student participation in online courses. A well-organised, varied, coherent and consistent communication process throughout the academic year encourages students to participate more often in the course. An example is online course 1, where effective communication that managed to involve students in the teaching-learning process was found. This is demonstrated by the fact that they accessed the platform more often, and sent and read more messages. Consequently, quality in communication processes in VLEs has a direct impact on online participation. The wealth of tools used, a personalised service, the adaptation of the design and organisation of communication tools to the needs of the discipline and of users, as well as offering a variety of discussion topics, coordinating and directing them effectively, supporting students personally and constantly, and offering quick, smooth interaction are, together, the main variables that intervene in participation and online communication.

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