Digital skills mentoring for online teaching and evaluation in the Industrial Engineering Faculty of the University of Málaga

M M Lozano¹, S Martín*¹, M Herrera¹, M J Cano¹ and L Sevilla¹

¹ Department of Civil, Materials and Manufacturing Engineering, Universidad de Málaga, C/Dr. Ortiz Ramos s/n, E-29071 Malaga, Spain

*Corresponding author: smartinb@uma.es

Abstract: COVID-19 pandemic has forced the usual face-to-face educative activities to change to e-learning processes. When the faculty has the necessary knowledge on digital skills this obligatory step becomes easier. Videoconferences, as synchronous communication tool and Learning Management Systems (LMS) allow to carry out the e-learning actuations. The University of Málaga has required to adapt its educative activities to e-learning processes due to the pandemic. To facilitate this change, a digital skill mentoring actuation has been implemented in all faculties of the University of Málaga. The digital skill actuations have been related with evaluation processes and with communication systems to development the teaching classes. In this work, the experience in the Faculty of Industrial Engineering of the University of Malaga, is exposed. The results obtained show that the previous LMS used by the University of Malaga facilitated the change to the e-learning process in the Faculty of Industrial Engineering.

Keywords: Mentoring, Online, Industrial Engineering, Digital skills, Covid-19.

1. Introduction

The current situation caused by the COVID-19 pandemic led to many changes in the daily social activities [1]. The virus transmission by air made it necessary to reduce direct contact between people [2]. In this sense, work and educational activities had to adapt to this new situation in order to continue carrying on with their function [3]. The online communication tools that are already in use by the institution have been very useful to continue with these activities since they made possible to reduce direct contact.

In the educational field, the educational process is commonly face to face. Nevertheless, this technique needed to be adapted to reduce or eliminate the teacher-students contact. In this case, due to the technological advances, the e-learning process is the natural step to adapt the educational activities to this new situation [4,5].

The e-learning process offers numerous advantages: reduces distance between teacher and students, offers individual follow-up by the teaching staff, flexible schedule, among others [4,6]. In addition to the e-learning process, there are different Information and Communication Technologies (ICT) that can be considerate and included as tools to improve the experience [7].

Learning Management Systems (LMS) are designed to provide online learning spaces which facilitate the students communication between themselves as well as between students and teachers in its synchronous and asynchronous options. In this virtual space, the educational content is available to the student and it makes possible to also carried out the evaluation [8,9].
In addition, the video-conferences have become the new way to work outsynchronous online actuations, where the teacher can provide the information to the student in similar conditions as in the classroom. Computing presentations or digital blackboards are some of the tools that facilitate the educational content description to the students during the video-conference [10].

Using LMS tools, video conferencing software or other online learning applications, requires to the teachers to be prepared for its use. In this sense, the educational institution teacher training plans are of great importance [11].

The theoretical contents of technological degrees are always accompanied by the resolutions of numerical exercises. The explanation of the typology of exercises is usually done face-to-face with the student, using a blackboard. However, the use of ICTs can be an opportunity to solve them remotely [12].

The Spanish government, due to the COVID-19 pandemic, declared the need for a population confinement and the face-to-face educational activities cessation in March 2020. This forced the University of Malaga to change its educational process to e-learning.

The University of Malaga, prior to the pandemic, used a Moddle-based LMS, which provided a space to share information or to deliver activities to students and teachers. This e-learning tool has been employed for teachers and students for the last years. In spite of this, a low number of professor use or know different applications of the Moodle environment.

In addition, face-to-face the evaluation process (examinations) is the one that was naturally implemented at the Faculty. The new situation forced a change in this evaluation methodology, being Moddle evaluation tools the ones used and implemented.

To address possible shortcomings in the use of these technologies, the University of Malaga had created a digital skill mentoring processes. Teachers trained in digital skill from each faculty were selected and proceeded to created courses to teach and advise other teachers on the use of these tools for the e-learning process.

In this work, the methodology applied for this labour and the results obtained in the Faculty of Industrial Engineering at the University of Malaga, have been exposed.

2. Methodology

The purpose of the University of Malaga with the mentoring process is to develop digital skills related with the new teaching and evaluation processes. To do that, the Faculty of Industrial Engineering selected two professors with previous knowledge in these digital skills. The methodology employed to achieve these objectives is exposed below.

The mentoring process has been carried out in the LMS of the University of Malaga, where a subject has been created. This made possible to create a similar environment to the subject environment the teacher is responsible of. Registration on the virtual training campus has been voluntary, seeking to increase the teacher participation in the mentoring process. To this end, the faculty management and the head of faculty departments sent different emails informing of this action.

To decide the actions to carry out along the mentoring process, an initial evaluation related to the teacher’s digital skills knowledge has been implemented. To do this, a quiz related with the e-learning educational and the evaluation process has been proposed to the participants using the tools that Moodle has. The different questions in the quiz are exposed:

- QI.1. Prior to the COVID-19 pandemic, what are the evaluations tools that you use in your subject?
- QI.2. Due to the COVID-19 pandemic, what are the evaluations tools that you expect to use in the e-learning process?
- QI.3. Do you have experience using Moodle’s evaluation tools?
- QI.4. Have you ever used video-conference software?
- QI.5. What video-conference software do you know?
- QI.6. Do you have enough knowledge to facilitate student connectivity in the online process?
The results obtained in this quiz allowed to decide which are the main actuations to carry out in the mentoring process. In this case-study, the mentors focused their actuations in the elaboration of video-tutorials and seminars.

Regarding the video-tutorial, 18 videos have been performed using Screencast-o-matic software, Microsoft video edition and PowerPoint video utilities. This is an open broadcaster software screen recorder. The videos are around 5 minutes length and are focused on the evaluation process. These videos have been available for the participants in Moodle during all the mentoring process, being able to watch them at any time and any day of the week. The topics of the videos elaborated are the following:

- Making questions for off-line questionnaires. Commonly, questionnaires are elaborated in office software like Word or other similar open software’s. In this case, there are templates available on different websites that facilitate questions implementation into Moodle. This facilitate to consult, to modify, to reuse or to store the question performed.
- Making questions for on-line tests. Moodle has different types of objective questions. A video of how to elaborate each one in Moodle environment has been performed.
- Tutorials for the preparation of questionnaires. Once the questions are prepared, Moodle requires to elaborate a questionnaire that includes the different available questions. The procedure to elaborate it has been explained in different videos, focusing on different aspects as restriction access conditions, results publication, test available period or question options possibilities.
- Techniques for the creation and evaluation of activities. Throughout the teaching period, different activities have been proposed. Moodle includes different options to generate activities and to establish different evaluation criteria.
- Preparation and development of questions or problems. In technological degrees, problems resolutions are usually employed in the educational process. In this sense, some of the different possibilities that Moodle tools offer, have been evaluated in the videos.

The second main activity was the development of video seminars related to the use of video-conferencing software and on the on-line evaluation process, with a duration of 2 hours each. Google Meet has been the software used to conduct the seminars.

According to the video-tutorials elaborated, the seminar related to the on-line evaluation process was focused on the explanation of questionnaires and activities on Moodle environment. In addition, different doubts were solved and previous experiences were shared. Regarding the use of video-conferences software’s, Seminario Virtual B, based in The Big Blue Button on Moodle, and also Google Meet applications and widgets were explained and were exposed. In particular, Seminario Virtual B is a video-conference software implemented in Moodle by the computer staff of the University of Malaga.

A subject created in the Moodle space has been prepared to contain all the information published by the University of Malaga related to the educational on-line process. This information has been continuously actualized and communicated to the participants along the mentoring actuations.

A forum in Moodle has been created to solve all possible doubts originated along the mentoring process. In addition, the mentor emails were available for the participants to facilitate other ways to propose the different questions required. Furthermore, video-conference has been considered another tool to solve these possible doubts. At the beginning of this mentor activity, the commitment to solve all possible doubts within 24 hours was established.

Finally, a quiz to evaluate the professor impression about the educational adaptation process to this new situation have been carried out. In this sense, different questions evaluated between 1 to 5 have been proposed, being 1 the minimum and 5 the maximum:

- QF.1. Your transition from face-to-facet to e-learning process has been easy.
- QF.2. In general, the professor transition from face-to-face to e-learning process has been easy.
• QF.3. The access of video classes for the students has been difficult.
• QF.4. The student’s attendance to video classes has been reduced compared with face-to-face attendance.

In addition, questions have been raised about the videoconferencing software used by the teacher throughout the e-learning process.

It is important to highlight that the mentors have maintained a continuous communication along the mentoring process. This communication has allowed to generate a more accurate answer to the participants doubts and the tasks have been distributed among them, generating a clear documentation that has facilitated the participants learning.

3. Results

The mentoring experience was developed between April to September 2020. Twenty professors of the Industrial Engineering Faculty of the University of Malaga have participated in this digital skills training activity. Taking into account that the teaching staff in this Faculty is around 120 professors, it can be considerate a low participation. This could be due to the fact the University of Malaga LSM has been usually employed by its faculty, previous the pandemic situation. The initial quiz result can be observed in figure 1, figure 2 and figure 3.

The main uncertainty in the professor staff was how to evaluate the students using online tools, ensuring the student authorship. This fact may be because the mentoring process started when the teaching process had already started. In addition, QI.3 results show that most of the teaching staff does not have previous experience in the use of evaluation tools in Moodle (58%).

In the case of technological degrees, the resolution of problems in the evaluation process or development issues in more theoretical subjects is often proposed. The difficulty of monitoring the use of online tools has led the teachers to the preference of other assessment methodology, such as oral exams or tests, to conventional methodologies such as problem solving, tasks or development questions. In spite of this, problems resolution remains one of the most widely used tool to evaluate the students, combined with the test resolution and with team works.

Figure 1. Initial question QI.1 and QI.2 answers.
Figure 2. Initial question QI.3, QI.4 and QI.6 answers.

Figure 3. Initial question QI.5 answers “Which video-conference software do you know?”.

Video-conferencing software has become the main tool for developing online classes. Unlike online assessment tools, teachers have used this software before the pandemic (71%), with Google Meet and Microsoft Teams being the most used. Despite this, teachers felt that some connectivity problems that existed with students were difficult to solve (57%).

The results obtained in this initial quiz, show that the mentor’s actions have to be focused mainly on the evaluation process and in the use of video-conference software’s to ensure a correct development of on-line classes. In this sense, different video-tutorials and different seminars were carried-out according to what is stated in the methodology.

Throughout the entire mentoring process, participants’ doubts were solved using on-line tools. The email has been the most used communication medium (69%), and the video-conferences have been the
second one (18%). These questions are mainly focused on the use of evaluation tools in Moodle (56%). These results can be observed in figure 4.

Once the evaluation process was carried out, a final quiz was proposed to the participants. These results are shown in figure 5. The professor staff consider that the change to on-line process, in general terms, has not been difficult. This fact can be related to the previous professor staff experience in the use of Moodle and other technological tools.

Regarding the student’s experience, the habitual use of ICTs has reduced the problems originated in the e-learning process. In addition, the student assistance to on-line classes show a slight increase compared with traditional assistance to face-to-face classes. This result can be related to the students’ uncertainty of on-line methodology.

![Figure 4. Distribution of the professor staff raised doubts.](image)

![Figure 5. Final quiz results.](image)

Finally, a meeting between all the mentors of the different faculties of the University of Malaga were carried out. The main experiences have been shared in the meeting. According to the results exposed in this work, the mentors assigned to the technological degrees (Informatics engineering, Telecommunication engineering, industrial engineering, among others) agreed that the previous use of
ICTs in these degrees have facilitated the change to the e-learning process. In addition, it is important to highlight that the University of Malaga has always bet on the use of ICT as a complement to the face-to-face educational process. In this sense, throughout the last years, in its continuous training plan for the professor, different ITCs courses were proposed related to the use of Moodle tools and the creation of digital contents.

4. Conclusions
This work shows the methodology employed and the results obtained in the mentor process carried out in the Faculty of Industrial engineering at the University of Malaga.

The methodology used was focused on the generation of different video tutorials, the realization of seminars and resolution of doubts. All of them are related to the use of video conferencing software in the teaching process and to the use of Moodle tools in the evaluation process. To this end, a prior analysis of the knowledge of the teaching staff was carried out.

As for the results obtained, it can be considered that the previous experience of the Industrial Engineering faculty in the use of Moodle tools has facilitated the change from the face-to-face methodology to the e-learning. Moreover, the student’s adaptation to the new teaching process cannot be considered complex.

Finally, in general terms, the digital skills mentoring has turned out to be a good experience for the faculty of the University of Malaga, as a response to the difficult repression of the pandemic. In addition, the University of Malaga is encouraged to maintain continuous training activities in ICT and other activities that allow the development of digital competences of the teacher staff.

Acknowledgements
The authors thank University of Malaga-Andalucía Tech Campus of International Excellence for its economic contribution on this paper.

References
[1] Herrmann H A and Schwartz J M 2020 Why COVID-19 models should incorporate the network of social interactions Physical Biology 17
[2] Kioutsioukis I and Stilianakis N I 2021 On the Transmission Dynamics of SARS-CoV-2 in a Temperate Climate International Journal of Environmental Reasearch and Public Health 18 (1660)
[3] Hsu W J, Lo H and Yang C 2021 The Formulation of Epidemic Prevention Work of COVID-19 for Colleges and Universities : Priorities and Recommendations Sustainability 13 (4) 2081.
[4] Gutiérrez I, Álvarez V, Paule M, Pérez-Pérez J and de Freitas S 2016 Adaptation in E-Learning Content Specifications with Dynamic Sharable Objects Systems 4 (2) pp 1–24
[5] Xu Y and Tang Q 2021 The reform of modern education during the COVID-19 pandemic Journal of Physics: Conference Series 1748 p 042051
[6] Salmerón-Manzano E and Manzano-Agugliaro F 2018 The higher education sustainability through virtual laboratories: The Spanish University as case of study Sustainability 10 (11)
[7] Martín-Béjar S, Martín M J, Trujillo F J and Bermudo C 2019 Utilización de TIC en el ámbito educativo de la Ingeniería de Procesos de Fabricación Innoeduca. International Journal of Technology and Educational Innovation 5 (1) p 55
[8] Sáiz-Manzanares M C, Marticorena-Sánchez R, Muñoz-Rujas N, Rodríguez-Arribas S, Escolar-Llamazares M C, Alonso-Santander N, Martínez-Martin M Á and Mercado-Val E 2021 Teaching and learning styles on moodle: An analysis of the effectiveness of using stem and non-stem qualifications from a gender perspective Sustainability 13 (3) pp 1–21
[9] Orishhev A B, Mamedov A A, Kotusov D V, Grigoriev S L and Makarova E V 2020 Digital education: VKontakte social network as a means of organizing the educational process Journal of Physics: Conference Series 1691 (1)
[10] Martín C T, Acal C, El Honrani M and Estrada A C M 2021 Impact on the virtual learning
environment due to covid-19 *Sustainability* **13** (2) pp 1–16

[11] Sánchez-Cruzado C, Santiago R and Sánchez-Compañía M T 2021 Teacher Digital Literacy: The Indisputable Challenge after COVID-19 *Sustainability* **13** (2) pp 1–29

[12] Moreno-Guerrero A J, Aznar-Díaz I, Cáceres-Reche P and Alonso-García S 2020 E-learning in the teaching of mathematics: An educational experience in adult high school *Mathematics* **8** (5)