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The current educational atmosphere regarding Graphic Engineering courses in university degrees

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Abstract

Subjects regarding graphic content are essential in engineering and architectural degrees; however, a significant lack of updated teaching methodologies are still commonplace among them. Although some assumptions can be made relating the possible causes of this mishap, truth is that no clear answer can be stated. Aiming to gather all relevant information that may bring light into real causes that led to such situation, 250 educators have been surveyed to collect first-hand perspectives on the real needs of these type of subjects. Results show that new bespoke teaching platforms to deal with graphic contents are being demanded by lecturers, especially in the case of technical drawings. Furthermore, educators preferred the use of free software that also allows autonomous learning and the implementation of innovative methodologies.

Keywords: *graphic engineering; e-learning platforms; remote learning; university degrees.*

1. Introduction

New pedagogical perspectives aim to avoid the traditional method of teaching methods where a lecturer expose theoretical contents during the whole session with no active student enrollment. In this sense, new methodologies tend to place students in the center of the teaching-learning process, as in the case of flipped classrooms (Toriz, 2019), gamification (Da Rocha Seixas et al., 2016; Gómez-Jáuregui et al., 2017), or problem-based learning (Hsieh & Knight, 2008).

In the case of engineering courses, all these methodologies have been successfully implemented and combined with new technological resources as the use of specific software or novel online learning platforms where undergraduates can progress at their own pace. Altogether has transformed the class from a space to share theoretical knowledge into a space to also improve

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social (Calderón1 et al., 2018) and professional skills (de Campos et al., 2020; Lauana et al., 2022).

Related to graphic engineering subjects, such as Graphic Engineering or Industrial Drawings, novel methodologies have been successfully implemented, but there still is a significant lack of bespoke online platforms or customized teaching software to address the necessities of each lecturer. Hence, there is a significant tendency to continue using antiquated teaching techniques. Nevertheless, it worths noting that sometimes the own lecturers delay new updates implementation due to a lack of confidence in the promised results (Martí-Parreño et al., 2016)

To better comprehend the real and current demands that must be overcome in graphic engineering classes, 250 lecturers from different European universities have been surveyed to analyse: the profile of students enrolled in graphic subjects, the characteristics of their class groups and the methodologies that they use; taking special consideration on their relationship with e-learning platforms.

2. Methodology

Questions implemented in the survey must cover the whole spectrum of fields that influence the current teaching experience. For this reason, they were tailored to address issues related to the average teaching method used, state of the art about the relation between online learning platforms and professors and future needs and possible suggestions to improve current teaching methods. Most of the questions were closed-ended, although open-ended ones were possible to the latter group.

To reach the largest number of professionals related to the teaching of graphic contents, a survey formed by 11 questions was implemented on an online platform. All data was collected using anonymous responses to guarantee its neutral treatment. Instead of employing a commercial survey platform, a bespoke webpage was specifically created to host the survey. Subsequently, its link was sent to European universities, asking them to additionally spread it among their professors. Additionally, several accounts and posts were employed to disseminate the survey through social platforms. All questions are shown in Table 1.

Furthermore, it is worth highlighting here that questions were written in Portuguese, Spanish, Frenc, English, Latvian, Lithuanian and Slovenian to reach the maximum possible audience after reducing possible language barriers.

Table 1. Questions and possible answers employed in the survey.

Question number	Question Text
1	How do you evaluate students' math pre-knowledge?
2	In your opinion, does your subject have enough academic hours?
3	How many learners are there in the group during your classes?
4	How much time do you spend checking one drawing exercise (min)?
5	What CAD software is used for teaching Technical Drawing fundamentals?
6	What kind of representations of teaching materials do you use?
7	Do you use any educational platform for online learning in your subject?
8	The educational platform you use...
9	In case you are using web platforms in your teaching process, where do you find biggest shortcomings of web educational platforms?
10	What are the possible future needs that should be analysed to improve student learning of Drawing?
11	What other suggestions that were not presented in the questions can you propose to the project development (teaching methodology, time spent on learning this subject, etc.)?

3. Results and discussion

The survey allowed to reach the perception of up to 250 professors related to subjects with a major graphic engineering component. Most of them (60.0%) agree on the fact that the average student has an adequate starting level to face the subject at a university degree. However, there is also a significant percentage of educators (29.2%) who consider that undergraduates have low level previous knowledge; almost tripling professors related to students with a strong background (10.8%). In this sense, it can be assured that most students enroll in graphic engineering courses at university with an adequate previous level. Nevertheless, 48.7% professors still demand more time to cover all the different modules forming a certain course, thereby highlighting the necessity of optimize teaching and evaluating tools. Addressing the adequacy of a given number of contents to a particulate schedule cannot be performed without also considering the number of students per group. It is obvious that the same course contents explained to larger learner groups may involve greater periods of time to ensure that all pupils understand most relevant aspects. To avoid this potentially biased conclusions, professors were asked to indicate the average number of learners on their groups. Figure 1 shows that most common scenario is classes with over 30 students working simultaneously. Therefore, improvements aimed to boost self-learning work by the students or tailored tracking progress by professors are encouraged. These last proposals would also be convenient to increase self-paced work by students; there overcoming the need of extra course hours demanded by 58.0% of surveyed educators.

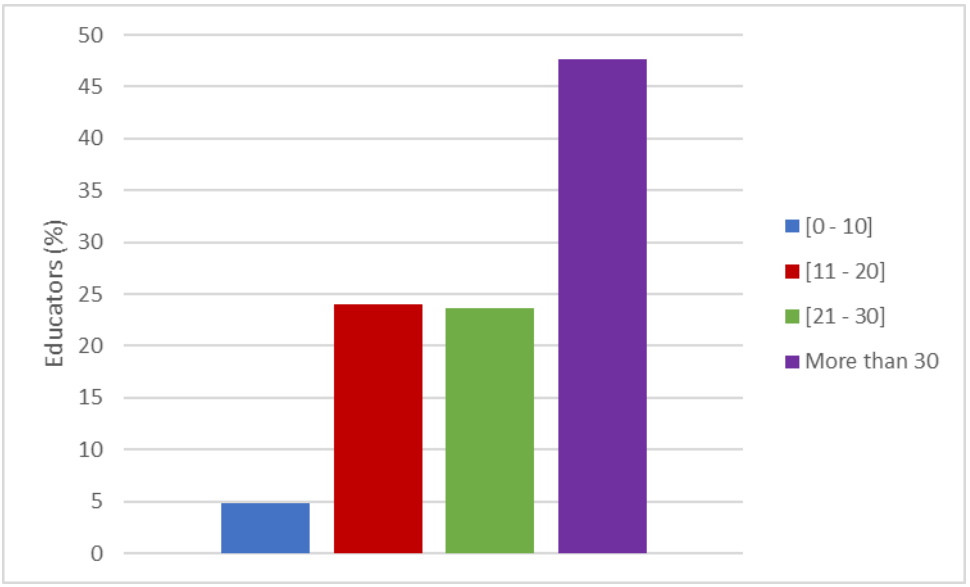

Figure 1. Number of learners on each session.

Increasing self-paced work by students may be seen as a positive aspect to be implemented. However, the correction time of each exercise may take an average of five to ten minutes for most educators, whereas only 23.6% are able to check them in less than five minutes (Figure 2). It worths mentioning that this average time was estimated regarding different activities in various groups of students; hence, it must be considered only for general considerations, as the kind of assessment may strongly influence its value. As long as the self-paced work by students involves the supervision of professors at some point, it will lead to a significant work overload which is not clear that could be handle by instructors; especially if there is no automated system or software to support the correction.

Another relevant obstacle to overcome when updating teaching methodology in graphic engineering subjects is that most professors (55.6%) rely on manual drawing techniques during their courses; hence, limiting the use of computer aided drawing (CAD) software to practical or laboratory sessions. In this sense, it is worth noting that those educators using CAD software may not translate it in the use of automatized correcting tools; so, it could be a source of delay anyways. In this sense, and based on the answers gathered on question 11, most lecturers highlight the absence of platforms focused on dealing with graphical contents, assuring that significant inconvenience arise when trying to adapt existing ones to generate or interact with graphical content. Furthermore, even in those rare occasions when it can be achieved for the simplicity of the contents or exercises, there is no possibility of self-assessment work by students, especially if an automated evaluation is desired.

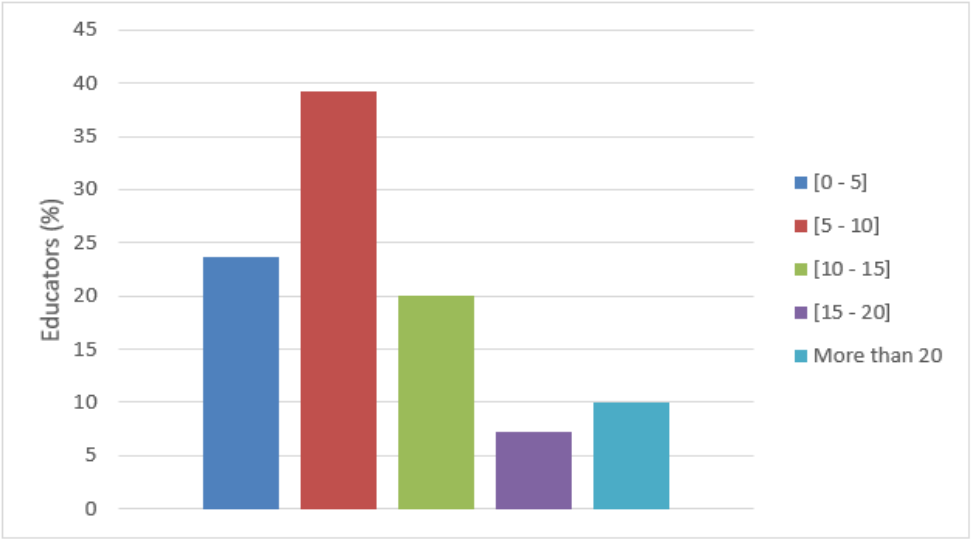

Figure 2. Average time employed on the correction of particular exercise by educators.

Figure 3 states that lecturers use online platforms to mainly share content, performed theoretical tests or communicate with their students. Only 5.2% already use them to prepare and solve exercises similar to those carried out face-to-face in the classroom or to allow students to have a form of unattended learning (8.4%). Furthermore, up to 43% feel that the platform is too time-consuming, which can be explained by the lack of platforms for teachers to customize and personalize the content shown to their students. This factor may also explain the lack of engagement of teachers in this field with digital platforms.

Although new bespoke online platforms to deal with graphical content would be welcome, use of technological resources is already a standard in teaching methodologies. As shown in Figure 4, PowerPoint presentations are the main option by lecturers to share contents with their students. Furthermore, there new resources related to virtual and augmented reality are progressively being used to update teaching methodologies. Even if combined they represent a modest 4.9% of the overall cases, their bond possibilities with 3D models (21.1%) and videos (18.7%) encourage to think on a promising future for them.

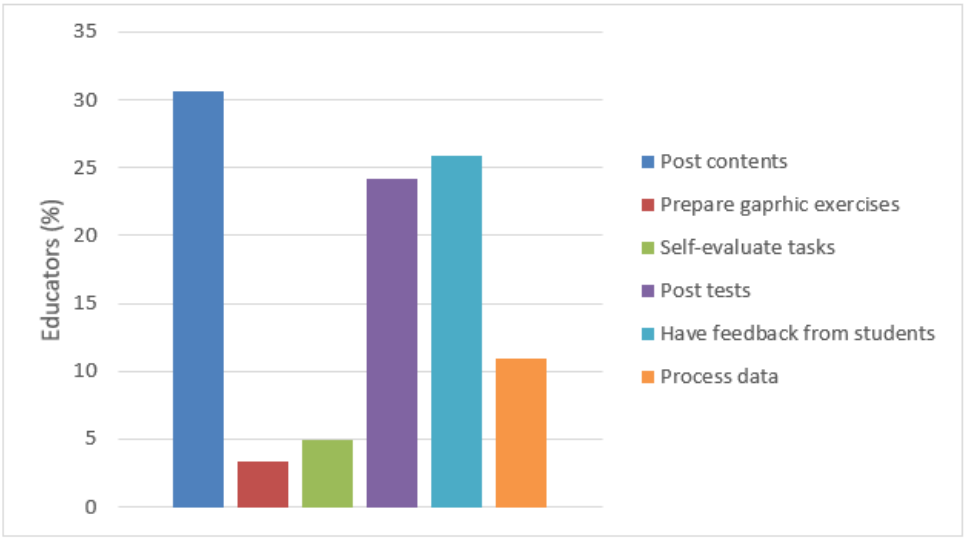

Figure 3. Use of e-learning platforms made by lecturers during graphic engineering courses.

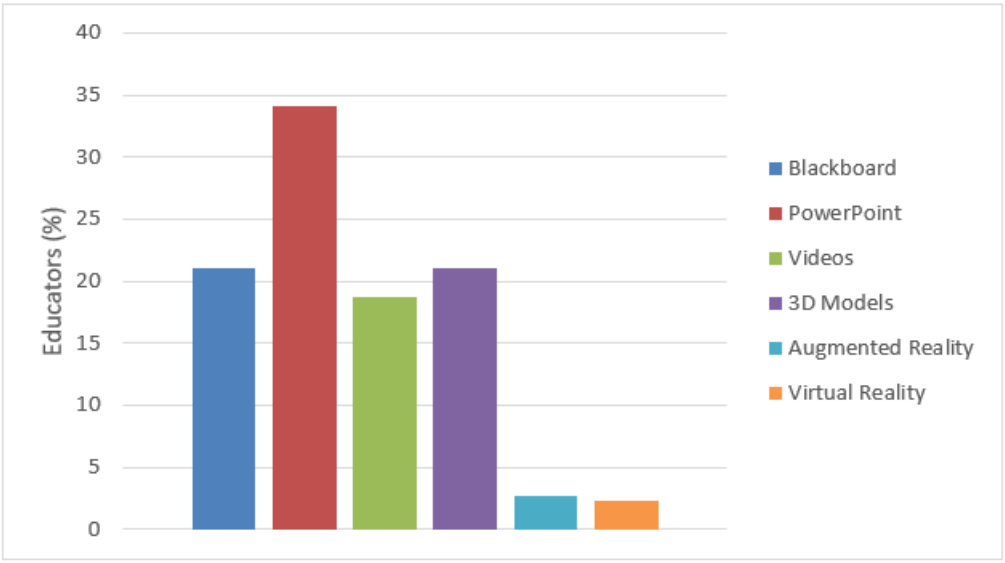

Figure 4. Resources used by lecturers during graphic engineering courses.

4. Conclusions

Graphic engineering courses have successfully introduced up to date methodologies regarding educators' opinions. Adequate background knowledge level of most students has facilitated this phenomenon; however, professors demand bespoke e-learning platforms specialized in graphic content that not only allow to share content, but also enables self-pace learning of students and automatic corrections.

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