

The importance of the student wellness in the new teaching/learning process

F. D. Trujillo-Aguilera^{1,a,*}, A. Pozo-Ruz^{2,b}, J. Sánchez-Rodríguez^{3,c} and M. O. Martín-Graciani^{4,d}

^{1,2} Universidad de Málaga, Departamento Tecnología Electrónica, Málaga, España (Spain)

³ Universidad de Málaga, Departamento Didáctica y Organización Escolar, Málaga, España (Spain)

⁴ Universidad de Málaga, Departamento Ingeniería Civil, de Materiales y Fabricación, Málaga, España (Spain)

^afdtrujillo@uma.es, ^bapozo@uma.es, ^cjosesanchez@uma.es, ^dmomartin@uma.es

*Corresponding author

Keywords: Power Electronics, Teaching/learning process, Multimedia tools, Educational software evaluation, E-learning, Burnout, Engagement, Academic stress

Abstract. Nowadays, the European Higher Education Area means an important change in the teaching/learning process: it is necessary to involve more efficiently to the students. Moreover, university education has undergone a significant change to new models that encourage the active role of students in the teaching/learning process. This new framework includes the increase in the development and use of new Information and Communication Technology in education and the analysis of the academic performance of students and their sensation of engagement and burnout. In the case study in this paper, a new teaching methodology is implemented and it is based on a kit of new software interactive tools for Power Electronics. The main objective of this experience consists of the design, development and implementation of a new multimedia resources in order to use them in the teaching/learning process of the subject. To evaluate the benefits and drawbacks of this new methodology and the compliance with the objectives, several surveys have been designed, for both students and lecturers. These results are complemented with the study of the student stress levels, information that will be complemented with an in-depth analysis of the got marks of the students and with the sensation of engagement and burnout, measured in terms of academic stress.

1. Introduction

Motivating students' interest is important so as to achieve learning objectives satisfactorily. In the new European Higher Education Area (EHEA) [1], it is required to encourage the independent study and active participation of the students: thought-provoking activities encourage students, by actively engaging them in their learning process [2]. At the same time of this new challenges, it is important to point the huge increase in the implementation and use of new information technology in education; based on the spreading of Information and Communication Technology (ICT) and its usage wisely.

ICT continues to spread throughout the world, and more and more people have access to the internet and its wealth of information and applications [3]. ICT is progressively including greater spaces in human beings' life, and education experiences its effect. Inside this new academic environment, and as an application of the great range of ICT facilities, the concept of e-learning plays an important role, hence the development of e-learning is linked to the growth of the ICT. E-learning

is the use of electronic media, including several and different forms of educational technology in the teaching/learning process [4].

Nowadays, the ancient form of teaching in classroom can be improved by the usage of new multimedia resources. It is widely demonstrated that the use of these facilities has significantly achieved a better student learning and effectiveness.

In the case study of the study presented in this paper, the lecturers of the Power Electronics (PE) subject, at the Universidad de Málaga, have noticed important complexities in the student learning mechanisms due to the difficult to understand the features of the power switched converters (several variables and parameters to take into account). Moreover, just using the blackboard and fixed slides [5, 6] it is very complicated to manage a dynamic teaching process and a pleasant environment in class that foster a better student understanding.

With this objective in mind, an important challenge is developed to innovate the teaching in PE subject and, therefore, to achieve an easier learning of the theoretical concepts of PE. This new methodology is based on the implementation of a kit of eight multimedia resources [7], enclosed in an educational platform as an open access web page appearance, which can be used as on-line teaching tool.

The advantages of this computer-aided on-line platform for PE are: it contains all interactive educational software tools needed for a PE course; it allows students to organize and schedule their learning process; and finally, it is very useful for any student of this discipline, all around the world, as it covers all the basic aspects of PE (theory and laboratory) [8]. In this context, it is very important to evaluate the implemented resources to know a useful measure of the effective application of these instruments and shows us a guarantee of their use.

The new increase of the student independence and the success in their career are very closer related to the engagement and attitude of the students. In order to obtain a more satisfaction feeling during the years of university, it is very important to analyze and study the student initial conditions (purposes, stress levels or expectation) and check these conditions during their stay in the university. And, of course, it is very important that the students can realize the constant concern of their lecturers.

Finally, it is presented, in this paper, an interesting study that combines student subjective sensations, like burnout and engagement, and the evaluation of several implemented educational tools. The objective of achieving an easier study of the theory and practice of PE, thanks to the use of these multimedia tools, has a strong influence in the burnout and engagement of the students.

2. Burnout and engagement

It is very important to take into account several psychological variables to measure the idea of the student wellness in their university environment. Two of this set of variables, considered and studied in this paper, are the burnout and the engagement.

The first one is a psychological term for the experience of long-term exhaustion and diminished interest [9], in conditions of wearing out from the pressures of work or study [10]. How the stress is processed determines how much stress is felt and how close the student is to burnout. One student, for example, can experience few stressors, but be unable to process the stress well and thus experience burnout. Another student, however, can experience a significant amount of stressors, but process each well, and avoid burnout. Several tests are used to determine the burnout level in each person [11].

The second one occurs when students make a psychological investment in learning [12]. It is increasingly seen as an indicator of successful classroom instruction, and as a valued outcome of the new teaching/learning process, above explained. Students are engaged when they are involved in their work, persist despite challenges and obstacles, and take visible delight in accomplishing their work. Student engagement also refers to a student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process promoting higher level thinking for enduring understanding.

3. Evaluation and validation stages

3.1 Educational software evaluation

The evaluation of the developed resources mean an important task to know, with a suitable guarantee, its correct use in educational environments. The learning outcomes of an educational software are evaluated through performance tests typically used to judge the quality and the quantity of learning, which usually have the form of 'pre-tests' (input questionnaire, in this study) used to determine learning outcomes prior to the intervention and 'immediate' (satisfaction and validation questionnaires, in this paper) and 'delayed post-tests' (output questionnaire, in this paper) to examine learning outcomes after the experience [13]. The learning process refers to the usability of a product and should be evaluated by observing and measuring the end-users attitudes [14].

From the pedagogical point of view, there are several issues that must be analyzed regarding the personal data of the studentes (age, educational level), teaching (objectives, motivation, feedback, methodology) or content (types, strategies). From the technical point of view, several issues are studied: usability (efficiency, access to the information, navigation), as well as the interface features (screens, menus, icons, images, color, graphics, animations) [15].

For each new implemented interactive tool [7, 8], four surveys have been implemented [16] to validate these educational resources and their precise adaptation to the teaching/learning process. Three of these questionnaires are designed for students; and the fourth questionnaire is managed to five lecturers defined as an expert group.

3.1.1 Input questionnaire

The first questionnaire is implemented for the students and it evaluates their software knowledge and their willingness to work with the new educational web. This survey is filled at the beginning of the course.

3.1.2 Satisfaction and validation questionnaires

Once a new interactive tool has been developed, the students begin to use it and they assess each new implemented resource, by means of the satisfaction questionnaire. At the same time, this new tool is validated by the expert group, through the validation questionnaire. These two questionnaires analyze the interface features, the aesthetic features, the usefulness features, the technical features, the pedagogical features and some fostered skills and strategies.

3.1.3 Output questionnaire

Finally, this survey, for students as well, tries to detect the benefits and problems related to the usage of the educational platform for PE and the individual opinion of each student about the advantage and the facilities of the new teaching/learning process.

3.2 Burnout and engagement evaluation

The measurement of the engagement and burnout is related to the evaluation of the stress under several situations and conditions [17]. In the particular case of this study, academic stress is defined as that generated by the proper demands of an academic context, without the intervention of non-academic factors. The dimensions or evaluated academic stressors which will explain such stress (obligatory assignments, academic overload, perception of the teacher and perception of the PE subject) will be susceptible of intervention in order to control the intensity with which they are perceived by the students, thus affecting two fundamental aspects during the development of their studies: their psychological well-being and their academic performance.

Three questionnaires are implemented in order to analyze the stress situations and their consequences in the student well-being [18]. The first questionnaire deals with several situations that can cause stress in the students. The other two questionnaires formulate several thinking and feelings that are conceived when students confront an anxiety and stress situations [17]. The anxiety experienced often becomes the cause of negative consequences which affect the students' mental health and academic performance.

4. Results

The results have been calculated by considering only the students who completed the questionnaires correctly, both concerning to the educational software and related to academic stress (engagement and burnout). The results have been analyzed from the 2003-2004 course to the last one (2012-2013).

4.1 Educational software

Eight educational interactive resources have been implemented and evaluated by means of the different surveys explained in last section. Figure 1 shows the number of analyzed questionnaires in this experience.

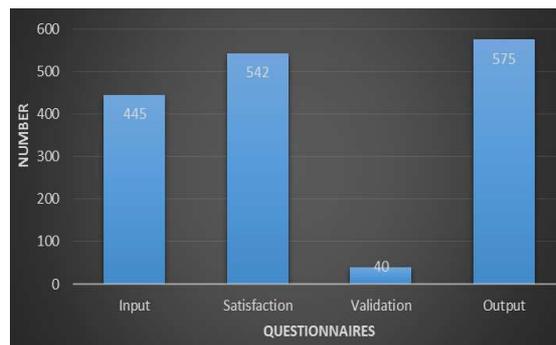


Fig. 1. Number of analyzed questionnaires.

Figure 2 shows the results of the input questionnaire analysis considering the most repeated positive responses of each of the ten open answers, gathered in function of similar aspects, in terms of percentage.

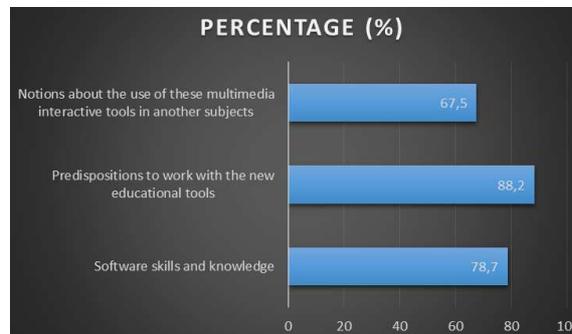


Fig. 2. Features of the input questionnaire analysis.

Figures 3 and 4 present the results of the satisfaction and validation survey, in terms of mean values of all the answers related to the most important aspects (explained in section 3.1) of each questionnaires analysis, being necessary to take into account the value of the standard deviation, to resolve the result validity. In figures 3 and 4, the shown low dispersions validate the obtained data in our study. The responses of each questionnaire are marked from 1 (entirely disagree) to 5 (entirely agree).

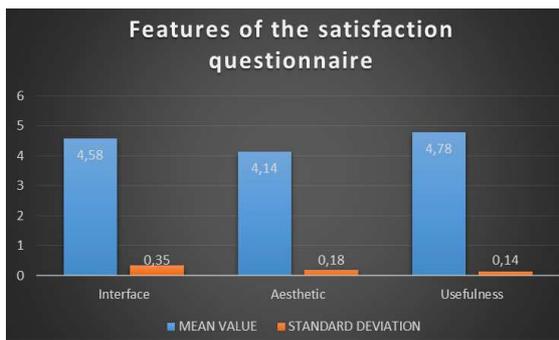


Fig. 3. Satisfaction questionnaire analysis.

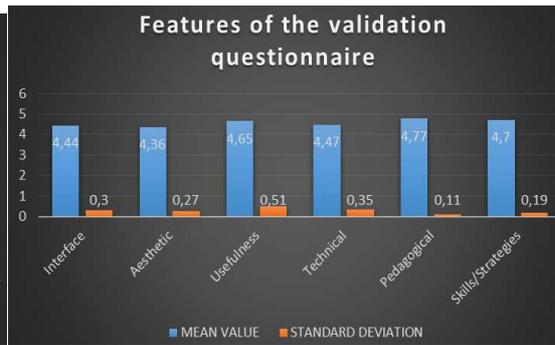


Fig. 4. Validation questionnaire analysis.

Finally, in figure 5 are presented the results of the output questionnaire analysis, taking into account, as in the input one, the most repeated positive responses of each open answers, gathered depending on similar aspects, in terms of percentage.

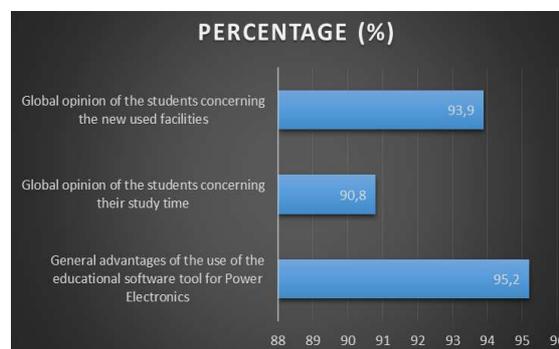


Figure 5. Features of the output questionnaire analysis.

4.2 Burnout and engagement

The number of analyzed questionnaires, related to academic stress, is 536. The examined variables encompass aspects about the student work overload; public discussion; exams; teaching methodological deficiency; relationships in the academic environment; or low academic esteem.

Some general conclusions can be drawn. The results showed that high levels of dedication and vigor are related to the development of the interactive multimedia tools. As far as the improvement of students' learning quality and their psychological comfort are concerned, these findings reveal the value of developing emotional abilities in the classroom as a buffer factor of academic stress elements and as an important vehicle to increase students' dedication towards learning. But, in general, students think that the methodological deficiency of the faculty and their overloading work contribute to increase their academic stress.

Furthermore, the results showed that although the stress level suffers by the students does not directly influence their academic results, there is a correlation with some problem situations, like the physical exhaustion, the negative thoughts and the nervousness. These three factors influence adversely in the student subject marks. Nevertheless, the students are more motivated in the subject study of PE in accordance with the total implementation of the educational software, comparing with other subjects.

Finally, the study shows [19] that women students suffer high levels of academic stress than men students. This result can be caused by the physiological differences between men and women. And it has been demonstrated that in another environment, like Health Sciences, the results are similar [20].

4.3 Academic marks

Some important conclusions can be drawn about the results of the academic marks of the students from the beginning of the experience to the last course:

- Reduction of the number of repeat students (third registrations or more)
- Decrease of the percentage of non-taken students to the final exam (below the 20% of the number of registered students)
- Reduction of the number of failed students in Power Electronics subject (theory and laboratory)
- High percentage of passing both subjects in the same course (90%)
- High percentage of passed students that consider the experience as innovative and original, with important implications in the teaching/learning process, and with a very good valuation of the hard extra work of the lecturer (94%)
- Mean valuation of the subjects (up to 5 points): 4.15 points (Power Electronics) and 4.63 points (Power Electronics Laboratory)

5. Conclusions and forthcoming works

In this paper, we have studied the importance of the educational software evaluation and the student burnout and engagement so as to improve a quality atmosphere and to guarantee the correct use of the educational software according to the initial goal. The analyzed surveys have demonstrate the accurate and correct use of the web educational kit in and out of classroom and the improving of the well-being sensation of students in the environment of PE.

It is very important to notice that the implemented new teaching/learning process have been innovative in the sense that, previously to this experience, no multimedia educational resource was used, so the endeavor has been substantial and hard to achieve. But the new concept of teaching/learning process based on multimedia resources allows that the lecturers were headed toward the achievement of the planned goals from the start of the experience.

Moreover, it is important to notice that there are few several subjects with similar experiences like the shown in this paper, in the Bachelor Degree of Industrial Electronics Engineering. For this reason, this experience allowed us to see a possible problem in the bachelor degree development: the attempt to synchronize the theory explanations with the use of the on-line resources. It is possible that students do not study suitably, or even if they do it, their learning-process work-rate was different, because there are many subjects without the innovative design explained in this paper and they have not achieved an important simplification in their design regarding the idea of the student independence. Moreover, the time problems in some subjects probably could reduce with this new multimedia experience.

The experience presented in this work was sufficiently motivating for students and their motivation increased along the subject developed. The motivation mechanisms produced better results in the academic marks and student wellness with a very active participation of the students in class.

Taking into account all of the above, it would be better to develop, in the Bachelor Degree of Industrial Electronics Engineering, a set of subject multimedia experiences can be performed to improve the general environment of the Bachelor Degree, the better perception of the students of their burnout and engagement, and increase the number of motivating subject for the students.

Problems that students have reported (difficulties to synchronize the activities of each subject due to the absence of educational tools) could be explained, at least in part, by the diversity of the lecturer motivation, preparation and awareness of the spreading of ICT tools and their improvement in the teaching/learning process.

The shown experience is often described as a teaching/learning methodology that develops, in our opinion, generic skills of self-guided learning in the students. It would be a way to acquire the so-called student independence competency. It means that the design of this educational experiences requires a careful thinking about all the student capabilities.

The experience presented here lead us to think about some questions that go beyond it. If independence competencies are necessary to use ICT tools, would we know how to be the final

environment with similar multimedia experiences in all of the subjects of the Bachelor Degree? In addition, would we know if this situation lead to a whole non in-person education? Our experience cannot answer these questions, but, in our opinion, to answer these questions is a very interesting line of future work.

And, finally, it is important to analyze the feasible dependence among the sensation of the student wellness in the PE subject and the worse sensation in the overall Bachelor Degree.

6. Acknowledgement

The present research has been partially supported by the “Vicerrectorado de Ordenación Académica y Profesorado” of the Universidad de Málaga by the Project of Educational Innovation PIE13/094.

References

- [1] The European Higher Education Area, *Bologna Declaration*, 1999.
- [2] D. P. Johnson and R. T. Johnson, *Learning together and alone: cooperative, competitive and individualistic learning*, Boston: Allyn & Bacon, 1999.
- [3] International Telecommunication Union, *Measuring the Information Society: The ICT Development Index*, 2009.
- [4] J. Stephenson and A. Sangrà, *Modelos pedagógicos y e-learning*. Barcelona: Universidad Abierta de Cataluña, 2003.
- [5] I. Plaza and C. T. Medrano, Continuous improvement in Electronic Engineering Education, *IEEE Transactions on Education*, 50(3), pp. 259-265, 2007.
- [6] I. Plaza, F. Arcega, F. Ibáñez, P. Garrido and M. Castro, Quality and innovation in Higher Education: code of good practices, *40th ASEE/IEEE Frontiers in Education Conference*, 2007.
- [7] A. Pozo-Ruz and F. D. Trujillo, A web-based tool for a Power Electronics course, *II Conferencia Internacional en Fomento e Innovación con Nuevas Tecnologías en la Docencia de la Ingeniería*, 2011.
- [8] A. Pozo-Ruz, M. J. Morón-Fernández, J. R. Luque-Giráldez, F. D. Trujillo-Aguilera, and G. Torcello, Plataforma virtual interactiva para la docencia del Laboratorio de Electrónica de Potencia, *XI Simposio Nacional de Tecnologías de la Información y las Comunicaciones en la Educación*, 2010.
- [9] C. Maslach and J. Goldberg, Prevention of burnout: New perspectives, *Applied and Preventive Psychology*, vol. 7, pp. 63-74, 1998.
- [10] C. Caballero, R. Abello and J. Palacios, Relación del burnout y el rendimiento académico con la satisfacción frente a los estudios en estudiantes universitarios, *Avances en Psicología Latinoamericana*, vol. 25(2), pp. 98-111, 2007.
- [11] R. H. Zabel and M. K. Zabel, Burnout among special education teachers and perception of support, *Journal of Special Education Leadership*, vol. 15, pp. 67-73, 2002.
- [12] F. Newmann, Student Engagement and Achievement in American Secondary Schools, *Teachers College Press*, pp. 2-3, 1992.
- [13] G. Marchionini, “Evaluating Hypermedia Based Learning”, in D. Jonassen and H. Mandl (eds.): *Designing Hypermedia for Learning*, Berlin: Springer-Verlag, pp. 355-374, 1990.

- [14]E. Georgiadou, A. Economides, A. Michailidou and A. Mosha, Evaluation of Educational Software Designed for the Purpose of Teaching Programming, *International Conference on Computers in Education*, pp. 745-752, 2001.
- [15]E. Navarro, Evaluación de materiales multimedia. Proyecto SAMIAL, *Comunicación y Pedagogía*, vol. 157, pp. 36-39, 1998.
- [16]F. D. Trujillo-Aguilera, A. Pozo-Ruz, and J. Sánchez-Rodríguez, On the evaluation stage for new Power Electronics multimedia interactive tools. The importance of the questionnaires, *IEEE Global Engineering Education Conference*, 2012.
- [17]R. J. Díaz, C. R. Glass, D. B. Arnkoff, and M. Tanofsky-Kraff, Cognition, anxiety, and prediction of performance in 1st-year law students, *Journal of Educational Psychology*, vol. 93(2), pp, 420-429, 2001.
- [18]R. Cabanach, A. Valle, I. Piñeiro, S. Rodríguez, and M. García, Cuestionario de estrés académico: construcción de una escala de medida, *V Congreso Internacional de Psicología y Educación: los retos de futuro*, 2008.
- [19]M. O. Martín-Graciani and F. D. Trujillo-Aguilera, Bachelor student academic stress in industrial engineering, *III Jornadas sobre Innovación Docente y Adaptación al EEES en las Titulaciones Técnicas*, 2012.
- [20]M. O. Martín-Graciani, Análisis del estrés académico en estudiantes de Grado de la Escuela Politécnica Superior de la Universidad de Málaga, Málaga: SPICUM, 2013.