

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/337110785>

Preparation of Technical Posters as a Tool to Improve Transversal Competences of Civil Engineering Studies

Article in *International Journal of Engineering Education* · November 2019

CITATION

1

READS

831

8 authors, including:



Javier Senent-Aparicio

Saint Anthony Catholic University

87 PUBLICATIONS 1,663 CITATIONS

SEE PROFILE



Patricia Jimeno-Sáez

Saint Anthony Catholic University

32 PUBLICATIONS 731 CITATIONS

SEE PROFILE



Mauricio E. Arias

University of South Florida

97 PUBLICATIONS 3,839 CITATIONS

SEE PROFILE



Leonard O'Driscoll

Cork Institute of Technology

1 PUBLICATION 1 CITATION

SEE PROFILE

Preparation of Technical Posters as a Tool to Improve Transversal Competences of Civil Engineering Studies*

JAVIER SENENT-APARICIO¹, PATRICIA JIMENO-SÁEZ¹, MAURICIO ARIAS², LEONARD O'DRISCOLL³, JULIO PÉREZ-SÁNCHEZ¹, LORETO LEÓN¹, FRANCISCO J. ALCALÁ^{4,5} and DAVID PULIDO-VELÁZQUEZ^{1,6}

¹ Department of Civil Engineering, Catholic University of Murcia, Campus de los Jerónimos s/n, 30107 Murcia, Spain.

E-mail: jsenent@ucam.edu, pjimeno@ucam.edu, jperez058@ucam.edu, Lleon@ucam.edu

² Department of Civil & Environmental Engineering, University of South Florida, Tampa, FL, USA. E-mail: mearias@usf.edu

³ Department of Civil, Structural & Environmental Engineering, Cork Institute of Technology, Rossa Avenue, Bishopstown, Cork, Ireland. E-mail: Leonard.ODriscoll@cit.ie

⁴ Geological Survey of Spain, Ríos Rosas, 23, 28003 Madrid, Spain. E-mail: fj.alcala@igme.es

⁵ Instituto de Ciencias Químicas Aplicadas, Facultad de Ingeniería, Universidad Autónoma de Chile, 7500138 Santiago, Chile.

⁶ Geological Survey of Spain, Urb. Alcázar del Genil, 4. Edificio Zulema, 18006 Granada, Spain. E-mail: d.pulido@igme.es

Adaptation to the European Higher Education Area implies a change of educational paradigm. In addition to the incorporation of academically directed activities and new tools for transmitting information, the change of approach also means new training explicitly oriented to develop the new professional competences. This paper presents the results from a funded teaching project aimed at exploring the use of the scientific poster as a tool to improve transversal competences in Civil Engineering students. To cope with this objective, a total of 68 civil engineering students from two different universities in Spain and Ireland were chosen. The poster design allows students to do in-depth research on a specific topic and to engage its research inquiry. The student's perception of this project was evaluated by means of two questionnaires surveyed prior and after the poster presentation. The research findings suggest that the scientific posters elaboration enables the development of different transversal competences of the students such as comprehension and integration, teamwork and leadership reinforcement, and effective communication. About 94% of respondents felt that this activity was valuable in improving their communication skills.

Keywords: civil engineering students; transversal competences; scientific poster; communication skills; research initiation

1. Introduction

The emergence of the European Higher Education Area (EHEA) has led to an important transformation in university teaching, not only in the practices but also in the educational structures and in the introduction of systems that control the quality of education. The main novelty concerning EHEA is the change from teacher-oriented methods towards learner-centered programs based on the acquisitions of competences in order to encourage the professional performance of students [1]. Nowadays, the focus has moved from teaching general and specific competences to the need of training our students in transversal competences that allow them to acquire the skills and knowledge demanded by the labour market [2]. There are three types of competences in the higher education domain: general, specific, and transversal. The first two types mainly refer to knowledge in a study area, and the peculiarity of the knowledge and procedures of a given profession [3]. As defined by Sicilia (2010) [4], transversal competences are usable capacities usable across domains, disciplines, and situations. Competences can be classified into instrumental,

interpersonal, systemic, and integrative, and involve a wide range such as leadership skills, capability to communicate and dialogue, teamwork, capability to analyze and synthesize complex information, and capability to reason critically and present clear arguments. For a large part of the university teaching staff, it is difficult to keep in mind that not only must they transmit knowledge (directly linked to specific competences), but they must also contribute to the acquisition and development of other skills (linked to transversal competences). In general, transversal competences are not usually studied and evaluated throughout the study programme, so it is necessary that, in the next few years, the university professor passes from being a transmitter of theoretical and practical contents from his area of knowledge to be a catalyst for the development of some of the transversal competences highlighted in the EHEA [5, 6]. There is a general agreement between professors and students that the development of transversal competencies could be improved [7].

To date, several studies concerning the importance of transversal competences development on university students' understanding, perceptions,

knowledge, and attitudes have been published. In a research conducted by Kajfez et al. (2018) [8] in three different universities from the USA, Civil Engineering students considered teamwork skills as the most important competence to develop their professional careers. Based on a study conducted over 300 engineering students in the University of Western Australia, Male et al. (2010) [9] identified competency deficiencies, communication skills, problem solving, and teamwork, among others. Another interesting work was Hernández-Linares et al. (2015) [10], who presented a study conducted at the University of Extremadura (Spain) from a sample of 100 engineering students. The results showed a need for training in management, communication, and leadership skills. Amante-García et al. (2016) [11] also found that oral and written expression and teamwork skills were the most important transversal competencies based on their study carried out with students and professors from the Technical University of Catalonia (Spain).

Therefore the exploration of strategies to facilitate the acquisition of these competencies among engineering students is needed. That is the reason to propose the use of the scientific poster to develop transversal competences such as oral and written communication, the ability to synthesize, and teamwork reinforcement. Posters have been previously identified as a useful learning tool over a range of disciplines. In the College of Engineering at the American University of Sharjah in the United Arab Emirates, El-Sakran and Prescott (2013) [12] emphasized that formal poster presentations have proven to be an effective vehicle for achieving more student autonomy, confidence, and responsibility. This finding is also reiterated in several other studies. For instance, Wallengren Lynch (2017) [13] focused on the experience of five students from a Masters in Social Work at the University of Gothenburg in Sweden that participated in an international conference in Bratislava, Slovakia. The author concluded that posters can be seen as a scaffolding tool in the educational development of the students. Carson et al. (2018) [14], from the School of Nursing at the Ulster University (UK), similarly outlined the group poster development as a good strategy for enhancing student engagement, and promoting learning relationships and colla-

borative behaviors. In this context, this paper presents the results from a funded teaching project aimed at exploring the use of the scientific poster as a tool to improve transversal competences in Civil Engineering students. More specific objectives were to allow students to do in-depth research on a specific topic, engage its research inquiry, and evaluate whether there are significant differences between the results obtained in the different case studies where this activity was implemented. The experience reached a total of 68 students from two universities in Spain and Ireland. The benefits of using scientific posters to improve transversal competences are discussed, as well as the main challenges faced during the study. Finally, conclusions highlight how this study can be used as a reference for the design and implementation of similar approaches in other engineering teaching competencies.

2. Methodology

2.1 Participants

Students from different degrees and masters from two universities in two countries: the Catholic University of Murcia (UCAM) in Spain and the Cork Institute of Technology (CIT) in Ireland, were asked to carry out this study (Table 1). A total of 68 students participated in this project. The sample of UCAM includes Bachelor and Master students in a percentage of 54% and 46%, respectively whose ages ranged as 37% younger than 25 years, 49% between 25 and 35 years, and 14% older than 35 years. The percentages for the same ranks of the CIT sample were 64%, 9%, and 27%, respectively.

2.2 Experimental design

This project included two stages. Prior to student's forming groups, scientific papers were selected randomly by the instructor. Some guidelines for presenting posters were given to the students, including published documents [15–17]. A Power Point template was provided to students to start on the appropriate formatting of their poster. Despite that, students were encouraged to personalize the format of their posters as they wished. Students worked in groups of two-three persons. The group poster development adds the aspect of cooperative

Table 1. List of courses and number of civil engineering students participating in this study

Course name	Degree	University	Number of students
Water Supply	Bachelor	UCAM	15
Water Resources Planning and Management	Bachelor	UCAM	16
Wastewater Treatment Engineering	Master	UCAM	21
Advanced Water Resources Planning and Management	Master	UCAM	5
Structural Engineering	Bachelor	CIT	11

Table 2. Selected questions from the survey prior to the scientific poster preparation

No	Question	Response
1	Had a previous professional experience.	Yes or No
2	Number of oral presentations given.	<5, 5–9, 10–20 or >20
3	Prior to this assignment, knowledge of posters as tools to present scientific results.	Yes or No
4	Prior to this assignment, number of scientific articles read.	None, <5, 5–10 or >10
5	Do you think that you should improve your effective communication skills?	Yes or No
6	Do you think that your educational system values enough activities that strengthen oral communication skills?	Yes or No
7	How do you classify your effective communication skill?	Very good; Good; Normal; or Poor

behavior to the project, which tends to enhance both interpersonal and learning skills [18]. It should be remembered that the scientific poster is not a text document that summarizes a research article, but a visual representation, designed to complement an oral presentation. It only gives essential information, not detailed descriptions, without an excessive number of results. The use of tables, graphs, and figures was focused, to summarize the information on the why and for what of the student's work.

To assess the effectiveness of the scientific posters as a tool to improve transversal competences, we distributed two questionnaires. The questionnaires were designed by our team based on a review of the scientific literature on teacher effectiveness and satisfaction. Both questionnaires were anonymous and used closed-ended questions to measure students' perceptions on their knowledge of scientific posters and after the poster presentation, and the usefulness of this activity for improving transversal competences. Later, data was analyzed in R language (v 3.4.2) and plotted using the Likert package [19]. The first questionnaire was delivered to the

students the same day that the introduction about scientific research and poster presentation was imparted. The aim of this questionnaire was to measure the following dimensions (1) general data, for instance students age; (2) professional experience, in order to know if this could influence the results of the activity given that having professional experience in which areas could help these students to have more developed communicative skills; (3) experience in the university environment, in order to know the number of presentations that the students have made within the framework of their studies prior to taking this subject; and (4) previous knowledge about scientific research, for instance the number of scientific papers read prior to this activity. Thus, we can estimate the degree of development of the communication competences among degree courses, and highlight the differences between case studies. The selected questions of the first questionnaire and the subsequent responses are presented in Table 2.

The second questionnaire was delivered to the students following the oral and poster presentations,

Table 3. Selected questions of the survey after the scientific poster presentation

No	Question	Response
1	How many hours were invested in the reading of the scientific article?	< 2h, 2–4 h, 5–10 h or >10h
2	How many hours were invested in the preparation of this poster?	< 2h, 2–4 h, 5–10 h or >10h
3	How many hours were invested in the preparation of the oral presentation of this poster?	< 2h, 2–5 h, or >5h
4	What aspect did you make the greatest effort in making this poster?	Analysis of information and project topics; Synthesis of the most relevant aspects to the subject; or Poster design (format, fonts, colors, etc.).
5	How difficult was it to analyze and understand the project's subject?	Very hard; Hard; Medium; or Easy.
6	How difficult was it to synthesize the aspects most relevant to this project?	Very hard; Hard; Medium; or Easy.
7	Do you consider that the development and presentation of the poster is a useful tool to improve someone's visual and oral communication skills?	Most definitely; Quite a bit; Some; or Not really.
8	Do you consider that the development and presentation of the poster is a useful tool to improve someone's ability to synthesize and extract the key subjects from the topic presented?	Most definitely; Quite a bit; Some; or Not really.
9	Has this assignment helped me out understand better the subject cover in the class?	Most definitely; Quite a bit; Some; or Not really.
10	Regarding the skills developed in this assignment, which ones do you consider most important?	Visual and oral communication skills; Comprehension, synthesizing, and extraction of the most relevant information; or Teamwork skills.
11	How would you value having been part of this assignment?	Very positive; Positive; Satisfied; or Unconvinced.

in order to measure the impact of the activity and to measure potential benefits to be taken forward for future communication tasks. This second questionnaire consisted of 20 questions dealing with the time dedicated to study the scientific paper, creation of the poster and the presentation, and evaluation of this activity. Students were asked to indicate the most and least useful aspects of the activity, from the formative point of view. The selected questions from the second questionnaire and the subsequent responses are presented in Table 3.

3. Results and discussion

3.1 The first questionnaire: profile of the students surveyed

The questions of the first survey have been analyzed by different combinations of factors such as age, previous professional experience, experience in the university environment, and among universities. Approximately 57% of the total students had previous professional experience (about 56% of the UCAM students and about 64% of the CIT students). A significant relationship between age and experience was found (Fig. 1). The older the surveyed students are, the more the professional experience they have. About 91% of the overall sample over 35 years old had professional experience, whereas only 43% of students under 25 had professional experience.

When asked about the number of oral presentations made prior to this survey, only 19% of the

students had made fewer than 5 presentations and 44% over 10 presentations (Fig. 2). It is noteworthy that most of the students had some previous experience with oral presentations. From the 44% of the students polled with more than 10 oral presentations, 67% had professional experience compared to 33% who did not. No relationship between age and the number of oral presentations made was found. However, the data showed a positive relationship between professional experience and the number of oral presentations made by the students.

Within universities, there was a significant difference in the number of students who were familiar with the poster as a tool to present scientific results, and in the number of scientific articles read prior to this survey (Fig. 3). In CIT, 82% of the students knew of the poster prior to this work, as against 54% of the UCAM students (27% difference). Similar differences have been found with respect to the other question, 64% of the CIT students read more than 10 articles compared to 33% of the UCAM students (31% difference) (Fig. 3). These differences could be due to the difficulty of reading in a language different from the native one.

Three questions concerning the topic ‘Oral communication skills’ were asked. The majority of respondents (91% of the overall sample: 93% of the UCAM students and 82% of the CIT students) think that they should improve their communication skills (Fig. 4). However, there are differences among students, regarding their respective education systems. Highlights include that 70% of the

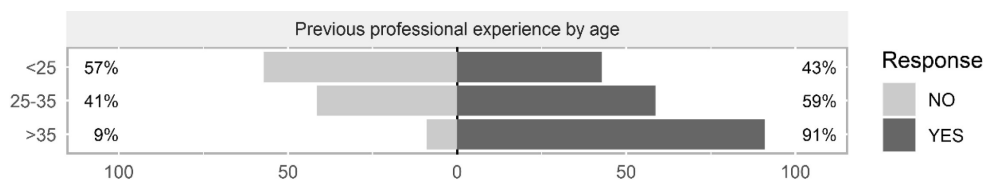


Fig. 1. Previous professional experience by age.

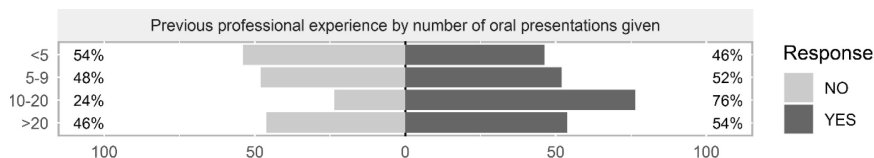


Fig. 2. Previous professional experience by number of oral presentations given prior to this work.

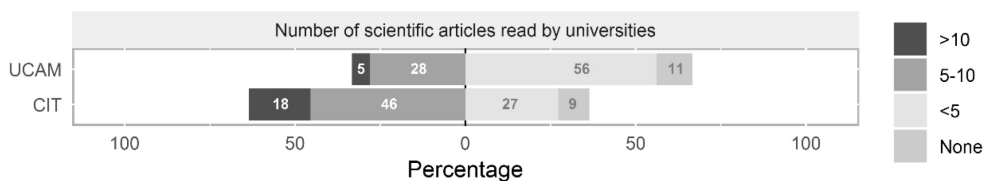


Fig. 3. Number of scientific articles read prior to this work by universities.

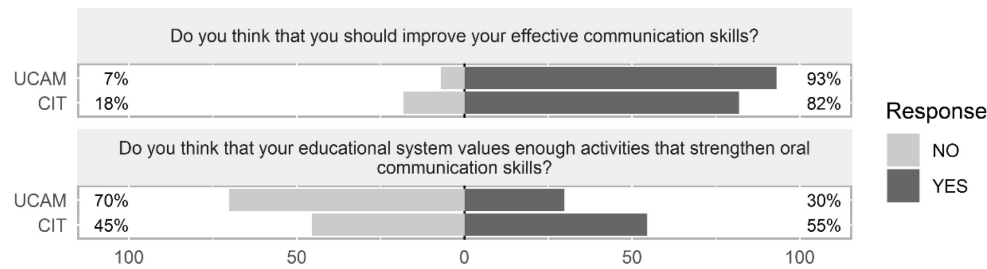


Fig. 4. Oral communication skills by universities.

students surveyed in UCAM showed that they were not satisfied with the activities that help strengthen oral communication proposed by the educational system implemented in Spain. However, in CIT the percentage of no satisfaction with the Irish educational system was lower (45%).

Focusing on the last question of the first questionnaire, the two universities did not show major differences in the students' ability to communicate. The majority of respondents (79% of the UCAM students and 82% of the CIT students) indicated that their effective communication skill was 'normal' or 'good'. Only 11% of the UCAM students and 18% of the CIT students valued their oral communication as 'very good'. Fig. 5 shows how the students with professional experience classified their communication skills highly. These results suggest that having professional experience or otherwise influences the student's level of confidence in communicating, given that having professional experience helps students to have more developed their communication skills.

The assessment of the ability to communicate was also closely related to the university experience. About 88% of respondents who valued their skills as 'very good' had made more than 10 oral presentations. However, all respondents who valued their ability to communicate as 'poor' made fewer than 5 presentations. Therefore, it can be deduced that increased experience in the university environment improves skills in oral communication.

3.2 The second questionnaire: impact of the activity

After the scientific poster presentation, students were again asked to participate in an anonymous survey to provide feedback on their experiences with

the project. This section analyses the results obtained in this second survey.

Three questions were asked about how many hours the students dedicated to reading of the scientific article, to create the poster, and to prepare the oral presentation. Most of the students were in the range of 2–4 and 5–10 hours for both questions at both universities. However, there were differences among the universities. The UCAM respondents spent less time than the CIT respondents to accomplish these three tasks. Highlights include that none of the UCAM respondents, compared with 36% of the CIT respondents, invested more than 10 hours in reading of the scientific articles. About 65% of the UCAM respondents spent less than 2 hours in preparing the oral presentation, while 55% of the CIT respondents spent 2–5 hours. In general, they spent less time on the final task than on the others, despite the fact that in the first survey, the majority had expressed the need to improve their oral presentation skills.

When asked about the more difficult task found when making this work, about 59% of the UCAM students selected 'Synthesis of aspects most relevant to the subject', followed by 'Analysis of information and project's topic' with 37%, and 'Poster design' task with 4% (Fig. 6). However, the responses of the CIT students were distributed in the same way among the tasks (36%, 37%, and 27%, respectively). For the Spanish students, these results could be justified by the difficulty of analyzing and synthesizing the information in a foreign language since the scientific articles were in English. Almost 70% of the total respondents found that the degree of difficulty of the analysis of information and the synthesis of aspects most relevant was 'hard'.

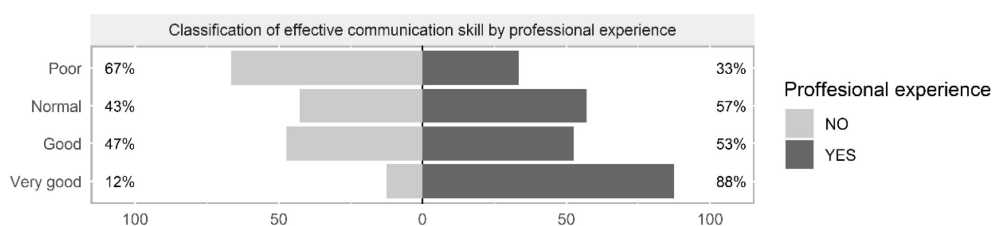


Fig. 5. Classification of effective communication skill of the students by professional experience.

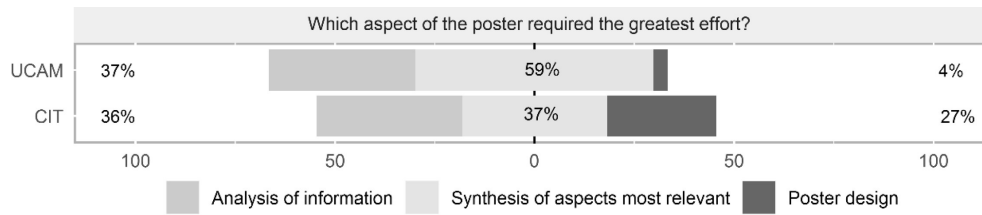


Fig. 6. The most difficult task in making the poster.

In terms of skills gleaned, the usefulness of this assignment was perceived as ‘very interesting’ (Fig. 7). Most of the students (94% combined) considered that the development and presentation of the poster was ‘most definitely’ or ‘quite a bit’ a useful tool to improve someone’s visual and oral communication skills, and enhances the ability to synthesize and extract the key subjects from the topic presented. None of them thought that this work did not contribute to improving those skills. The majority said that this work helps to better understand some of the topics covered in the subject. Only 28% and 3% of all respondents opined that this task had helped them ‘some’ or ‘not really’ to understand better the subject covered in the class.

In the response to the question ‘Regarding the skills developed in this assignment, which ones do you consider most important?’, 44% of the overall sample chose ‘visual and oral communication skills’, 53% chose ‘comprehension, synthesizing, and extraction of most relevant information’, and a small number of students (3%) chose ‘teamwork skills’.

In the analysis of the last question, respondents valued their participation in this project positively (Fig. 8). Highlights include that 88% of respondents found that their participation was ‘very positive’ or ‘positive’ while only 4% found your participation as ‘unconvinced’.

As presented, there was coherence in the results obtained in the two questionnaires. The results of the first questionnaire suggest that the respondents do not have a significant relationship with age, but with professional experience. The percentage of respondents with previous professional experience increased with age. A large percentage of respondents had experience of making oral presentations prior to this work. Only 19% of the sample had made fewer than 5 presentations. A direct relationship was found between professional experience and the number of oral presentations made. Different results among college students were obtained about their previous knowledge of scientific research, at the Irish college (CIT), a higher percentage of students than in the Spanish University (UCAM) knew the poster as a tool to present scientific results.

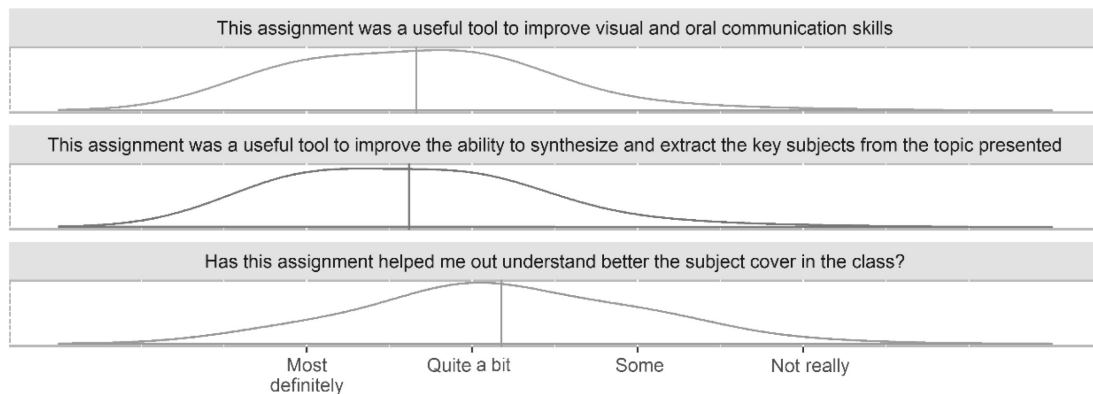


Fig. 7. Usefulness of this assignment.

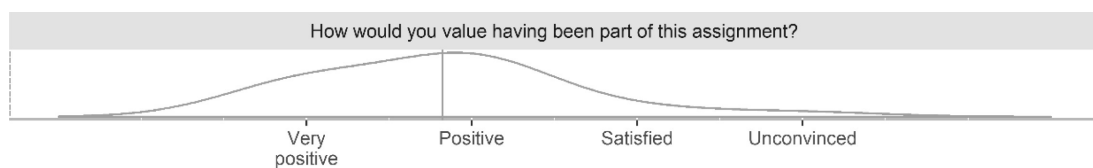


Fig. 8. Evaluation of this teaching project.

Also, the percentage of students who had read scientific articles was higher in CIT. However, reading in a foreign language can be a difficulty, which may be a reason why the Spanish students did not display as much experience of researching international literature. Regardless of the University, students showed a clear need to improve their oral communication. However, respondents at CIT were more satisfied than those at UCAM with the educational system to which it belongs, in terms of the importance that its system attaches to activities that enhance oral communication skills. The majority of respondents valued their oral communication skills as 'normal' or 'good'. Those who valued their ability best, that is, those who showed more self-confidence when communicating, were those with previous professional experience and more university experience. Therefore, experience contributes to the development of these communication skills.

The results of the second questionnaire showed that the CIT respondents spent more hours than the UCAM ones to accomplish all the tasks performed in this project. In general, the data suggested that the students spent less time in preparing the oral presentation, even though most of them considered that the effectiveness of their oral communications should be improved. Especially, and compared to the poster design, most of the Spanish students thought that the greatest effort was made for the synthesis of aspects most relevant to the subject. The majority considered that the tasks of analysis of the information and synthesis of the most relevant aspects were hard. Most respondents felt that this work helped to improve certain transversal skills, such as oral and visual communication, and the ability to synthesize and extract relevant information. Few respondents felt that this assignment helped improve the teamwork skills. This result should be analyzed to improve the questionnaires for the next courses. It is important that students also develop their teamwork skills. The responses provided by the students were overwhelmingly positive towards this project development, with 94% of students responding that the poster development helped them to improve their communication skills, with 88% of them finding that their participation was 'very positive' or 'positive'.

4. Conclusions

The main mission of universities is to produce, disseminate, and exchange knowledge for training of professionals. However, in the new competence-based academic culture, student learning encompasses the acquisition of basic knowledge in the field of study with different competences for the exercise and development of their professional career. In

today's knowledge society, the competences associated with communication are increasing, as well as those related to the selection, analysis and synthesis of information. The performance of this work favours the development of these skills.

This research has been applied within two similar Civil Engineering Degree courses from UCAM and CIT, with a wide positive feedback of the students surveyed. Moreover, the students highlighted the acquisition of three competences, preferentially as visual communication, oral communication, and the ability to synthesize and extract relevant information. When the answers from the two student groups are compared, we can conclude that overall results are similar except those specified ones from each University. Caution must be exercised in the interpretation of these findings due to the small sample size. Finally, this project seeks to be used as a reference for the design and implementation of similar approaches in other engineering teaching competences.

Acknowledgements—The researchers are grateful to the participating students for giving of their time to this study and would like to express our gratitude for the collaboration of the UCAM and CIT. This work has been supported by UCAM (PMAFI-PID-18/16).

References

1. E. de Justo Moscardo and A. Delgado, Change to Competence-Based Education in Structural Engineering, *Journal of Professional Issues in Engineering Education & Practice*, **141**(3), pp. 2556–2568, 2014.
2. D. C. Lopes, M. C. Gerolamo, Z. A. P. Del Prette, M. A. Musetti and A. Del Prette, Social Skills: A Key Factor for Engineering Students to Develop Interpersonal Skills, *International Journal of Engineering Education*, **31**(1), pp. 405–413, 2015.
3. E. Corominas, M. Tesouro, D. Capell, J. Teixidó, J. Pelach and R. Cortada, Perceptions of the teaching staff in view of the incorporation of generic competencies into university education, *Revista de Educación*, **341**, pp. 301–336, 2006.
4. M. A. Sicilia, How should transversal competence be introduced in Computing Education?, *ACM SIGCSE Bulletin*, **41**(4), pp. 95–98, 2010.
5. A. Uruburu Colsa, I. Ortíz-Marcos, J. R. Cobo-Benita and A. Moreno-Romero, Improving Engineering Students' Communication Competence: Designing Innovative Learning Strategies, *International Journal of Engineering Education*, **31**(1), pp. 361–367, 2015.
6. G. Jiménez, J. J. Pardo, E. Mínguez and D. Cuervo, Educational Initiatives to Develop Transversal Skills in the Nuclear Engineering Subjects at Universidad Politécnica de Madrid, *International Journal of Engineering Education*, **31**(1), pp. 229–237, 2015.
7. P. Martínez-Clares and N. González-Morga, Teaching methodologies at university and their relationship with the development of transversal competences, *Culture and Education*, **30**(2), pp. 233–275, 2018.
8. R. L. Kajfez, K. M. Kecskemety, E. S. Miller, K. E. Gustafson, K. L. Meyers, G. W. Bucks and K. Tanner, First-Year Engineering Students' Perceptions of Engineering Disciplines, *International Journal of Engineering Education*, **34**(1), pp. 88–96, 2018.
9. S. A. Male, M. B. Bush and E. S. Chapman, Perceptions of Competence Deficiencies of Engineering Graduates, *Australian Journal of Engineering Education*, **16**, pp. 55–68, 2010.

10. R. Hernández-Linares, J. E. Agudo, M. Rico and H. Sánchez, Transversal Competences of University Students of Engineering, *Croatian Journal of Education*, **17**(2), pp. 383–409, 2015.
11. B. Amante García, N. Olmedo-Torre, E. Cano García and M. Fernández-Ferrer, A Comparative Analysis of the Incorporation of Skills at the Master's Degree Level, *International Journal of Engineering Education*, **32**(5), pp. 2310–2317, 2016.
12. T. M. El-Sakran and D. Prescott, Poster presentations improve engineering student's communication skills, *International Journal of Education and Practice*, **1**(7), pp. 75–86, 2013.
13. M. Wallengren Lynch, Using conferences poster presentations as a tool for student learning and development, *Innovations in Education and Teaching International*, **55**(6), pp. 633–639, 2017.
14. O. M. Carson, E. A. Laird, B. B. Reid, P. G. Deeny and H. E. McGarvey, Enhancing teamwork using a creativity-focused learning intervention for undergraduate nursing students—A pilot study, *Nurse Education in Practice*, **30**, pp. 20–26, 2018.
15. S. M. Block, Do's and Don'ts of Poster presentation, *Biophysical Journal*, **71**, pp. 3527–3529, 1996.
16. R. A. Hites, How to give a scientific talk, present a poster, and write a research paper or proposal, *Environmental Science & Technology*, **48**, pp. 9960–9964, 2014.
17. N. Rowe, *Academic & Scientific Poster Presentation: a modern comprehensive guide*. Springer, Switzerland, 2017.
18. J. L. Menke, Implementation of Online Poster Sessions in Online and Face-to-Face Classrooms as a Unique Assessment Tool, *Journal of Chemical Education*, **91**, pp. 414–416, 2014.
19. J. Bryer, K. Speersneider, *likert: Analysis and visualization likert items*, R Package Version 1.3.5., GitHub: Vienna, Austria, 2016.

Javier Senent-Aparicio is a Full Professor in the Department of Civil Engineering at the Catholic University of Murcia (UCAM), Spain. He earned his M.S. in Environmental Engineering from the University of Florida and a PhD in Water Resources Planning and Management from the University of Murcia, Spain. His current research field of interests focus on hydrological modeling and he currently teaches hydrology and water resources planning and management.

Patricia Jimeno Sáez has a degree in Civil Engineering and a master's degree in Civil Engineering specializations by the Catholic University of Murcia (UCAM), a Master in Data Science and Computer Engineering by Universidad de Granada (UGR) and a PhD in Computer Technology and Environmental Engineering by UCAM. Thanks to a pre-doctoral fellowship from the UCAM, she was a research assistant at the UCAM where she was teaching in the degree and master in Civil Engineering.

Mauricio Arias is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of South Florida (USF), Tampa, USA, where he investigates linkages between the hydrological cycle, ecosystems, and society in order to promote sustainable management of water resources. He holds a Bachelor of Science and a Masters of Engineering in Environmental Engineering Sciences from the University of Florida, and a PhD in Civil Engineering from the University of Canterbury (New Zealand). Prior to arriving to USF in 2016, he was a Sustainability Science research fellow at Harvard University.

Leonard O'Driscoll is a Chartered Engineer and lecturer in the Department of Civil, Structural and Environmental Engineering in Cork Institute of Technology, and holds a Masters in Civil Engineering from University College, Cork. He co-ordinates the taught Masters in Civil Engineering in CIT, and teaches communication and research skills to undergraduate and post-graduate students in Civil and Structural Engineering.

Julio Pérez-Sánchez is civil engineer by the University of Granada and has a Master in Water Technology, Administration and Management and PhD by the University of Murcia. He is currently professor in UCAM university in Civil Engineer degree and master and has researched in water management based on the development of scenarios and forecasting tools since 2013.

Loreto León is a Civil Engineer since 2007 and has been a Master in Environmental Engineering since 2013 and PhD in Urban Planning since 2017. She has been a professor at the Catholic University of Murcia since 2009, responsible for the subjects of “Systems for the purification of wastewater and waste treatment” in the Master of Civil Engineering “Sanitary Engineering” and “Water supply” in the Degree in Civil Engineering. Since 2016 she is Academic Secretary of the Degree in Civil Engineering and of the Master in Civil Engineering at the same University.

Francisco J. Alcalá is Researcher at the Geological Survey of Spain, Assistant Professor at the UCAM, and Associate Research ‘Ad Honorem’ at the Autonomous University of Chile. He has more than 20 years of Research experience in investigating the human and global interactions underlying problems of groundwater quantity and quality for strategies of diagnosis, evaluation, operation, and dissemination. He has more than 15 years of Teaching experience in Geological, Mining, and Civil Engineering Degrees, Masters, and Doctorate.

David Pulido-Velázquez is Senior Researcher at the Spanish Geological Survey and assistant Professor at the UCAM. Field of expertise in Water Resources Systems analyses. Participation in more than 20 research projects with experience as Principal investigators (7), 27 SCI papers published, and important activity as reviewer and editor. More than 15 years teaching subjects (hydrology, water resources planning and management, etc) in the Hydraulic Engineering area of Civil Engineering Studies at different Universities and contributions in international Education Conferences.

Appendix: Poster example and evaluation criteria



Objectives	Poor (1 point)	Fair (2 points)	Good (3 points)	Very Good (4 points)	Score
Research work	Vague and incomplete.	Indicates some of the key issues.	Clear, concise and synthetic content.	Appealing and original idea.	3
Poster	Not made along the lines suggested.	Gathers some of the ideas but not systematically.	Contains the main issues but weaknesses in redaction.	Follows the proposal, contains the main issues, good design and concise language.	2
Presentation	Not reflects the contents.	Vaguely related to subjects.	Reflects the contents but not appropriately.	Great presentation in both form and content: clear, precise and original.	3
Communication	Poor and uninteresting language.	Fair staging but lacking in interest.	Good staging, interesting language.	Excellent presentation, appropriate and scientific language.	3
Teamwork	No teamwork.	Little sharing of results.	Appropriate team working .	Total sharing of work responsibility.	3
				Total Score	14/20