Outstanding methodologies in Erasmus+ projects related to eLearning

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ABSTRACT

This publication aims to present the progress made in the doctoral work related to the "Methodological guide for the successful use of digital technologies in education: Improvement of learning through European educational projects". The European Union and associated countries are working on European projects that provide relevant information on the methodologies used at the educational level through different programs, including the Erasmus+ Programme. These projects are the source of inspiration for the research that gives rise to this article. This paper focuses on how the research has been approached, shows the current state of the research, the progress made in the preparation phase of the questionnaire and its application, including the data analysis carried out so far. The main results got in the projects mapping process and the development of the survey are explained as well as the rate response of applying it, that has been of a 22%.

CCS CONCEPTS

• **Applied computing** → Education; Interactive learning environments.

KEYWORDS

Learning, ICT, students, teachers, European projects, eLearning

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1 CONTEXT AND MOTIVATION THAT DRIVES THE DISSERTATION RESEARCH

The context and motivation of the research reason for this publication was developed in the paper published in the TEEM'2020 congress on "Methodological guide for the successful use of digital technologies in education: Improvement of learning through European educational projects" [1]. It reflected on how the use of information and communication technologies (ICT) is increasing in our society and how the need for people to be trained in the necessary skills to participate effectively in a digital world have led to an increase in the use of digital technologies to improve the teaching-learning process.

This need has been reinforced by the COVID-19 pandemic that we have been living since 2020, which has caused the urgent adaptation of our educational centers, teachers, students, and families to distance learning methodologies using ICT. The great need we have to advance in technological competence, especially in education, has become evident.

In this sense, Charles Hodge et al. [2] have described the differences between well-planned online learning that creates meaningful experiences from courses offered online in response to a crisis or those set up for a special situation that appears suddenly.

Likewise, García-Peñalvo and Corell [3, 5] have also analyzed, in the field of higher education, the digital transformation of teaching and the existence of a methodological and skills crisis due to the COVID-19 pandemic.

Derived from the above, García-Peñalvo et al. have proposed a guide of recommendations to give tools to teachers and universities in the evaluation process due to the pandemic, which aim to help a large number of teachers who share this problem at this exceptional time around the planet when blended or distance classes have been promoted in those places where it has still been impossible to increase face-to-face classes [5, 6].

Gil-Fernández et al. [7] have identified changes in the way social media have been used for educational purposes both before and after lockdown, by detecting differences according to gender and type of university (classroom-based or online) and to conclude whether a response has been found to the same during the crisis.

Furthermore, H. Fardoun et al. [8] have carried out a review of the main difficulties encountered by educational institutions in Iberoamerica and some strategies used in the teaching and learning processes, including the proposal of an evaluation model in emergency situations in which special contingency plans must be implemented.

International and national organizations are working to achieve improvements in learning through ICT, including eLearning. In this area, it is worth highlighting what was detected in the International Computer and Information Literacy Study (ICLS) that while most of the teachers in the study indicated that they used ICT for teaching, its use was intended for relatively simple tasks, minimizing its potential for more complex tasks [9, 10].

Aznar Díaz et al. [11] established a system of quality indicators to evaluate good practices of mobile learning in Higher Education

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consisting in a system of 25 indicators, grouped into 5 variables, to be implemented in university educational contexts where the mobile learning methodology is applied.

The European Union, also aware of these needs, gives funding and encourages the development of European educational projects to improve educational systems and teaching-learning processes [12]. Through the Erasmus + programme [13], as well as previous programmes, numerous educational projects have been carried out in which new methodologies are analyzed and explored to achieve the desired improvement in training.

Therefore, the main objective of this doctoral work is to delve into what projects are being developed in this field and what makes some of them successful or good practice projects, so that lessons can be drawn that are useful for future projects.

To explain the current state of this Ph.D., the state of the art relative to the purposes of the research is presented first, followed by the working hypothesis, the methodology established for the analysis, the main results obtained so far, the current status of the thesis and present and future research contributions.

2 STATE-OF-THE-ART

The rise in the use of ICT in education, as well as the use of distance learning platforms to facilitate ubiquitous learning from any environment is posing great challenges [14]. It is true that the advantages of face-to-face training cannot be lost sight of, although the advantages of distance training for certain groups must also be highlighted. This type of teaching gives the possibility that all those who cannot participate in face-to-face training can continue training in a flexible and optimal way, which makes it a methodology in increasing demand. In this sense, there are several studies and publications related to different methodologies that allow flexible learning, as already indicated in the publication [1]:

- Mobile learning in Spain [15], which has shown that it is still used in a purely instrumental way and is still scarce - although it is apparently growing.
- Blended learning in Peru [16], which also shows the need to get more out of the use of this methodology to achieve a more autonomous training in view of their incorporation into the professional world.
- Joint programs and degrees [17], which facilitate the mobility of students and teachers to spend study periods in different institutions and offer opportunities for cooperation and mutual learning between institutions.
- The use of smartphones and its impact on attention [18], the use of smartphones could have beneficial effects in some processes in which attention is required, although it is not yet clear what the effects of the use of smartphones are in different domains related to attention.
- Interactive learning environments [19] that allow more flexible learning where students are the leaders of their own learning process. All this through the provision of services, tools, people, and resources.

Regarding eLearning, the GRIAL group has produced numerous publications related to eLearning, some of the most outstanding are those [20–24] relating to the current state and progress of eLearning, as well as future trends in this teaching-learning methodology.

These publications are only an example of the need to continue working to improve teaching-learning processes to discover what works and can be an example of good practice among education professionals. And this is the purpose of the work presented here.

3 PROBLEM STATEMENT

As indicated in the article [1], it is assumed that knowledge about the implementation of successful projects in which digital technologies have been used in education or eLearning is a reference, source of inspiration and orientation to achieve improvement in learning, curricular diversification, and an evident impact on the teaching-learning process using technology in education.

For this, it focuses on the analysis of educational projects considered as good practices or success stories in this field, to establish a framework with guidelines to consider in the development of educational projects in digital technologies in education and / or eLearning.

The Erasmus+ Projects Results Platform [25] is a key source of information to extract ideas that help in the elaboration of a methodological guide based on real projects that have been carried out and for which there is documented information.

4 RESEARCH OBJECTIVES AND GOALS

In this phase of the research [1, 26, 27] the main objective that is set is the use of a questionnaire to study what impact is detected through of European Projects regarding digital competence and digital technologies in education. As a result of this analysis, it is sought to know how to get the most out of digital technologies for future educational projects, as well as what are the success factors that the analyzed projects have had. The final goal is to provide guidelines of action that allows the design of projects, which t have a real and positive impact on the teaching-learning processes using the maximum potential of technology.

5 METHODOLOGY

The methodology used to carry out this research is based on the systematic reviews of research projects [28–30]. The advantage of using this approach is that it provides a way to analyze the projects getting an overview of the current trends and identifying the lacks and opportunities that allow to define new advances in the field of research. Moreover, this method gives the possibility to compare between finalized projects and have an idea of the evolution of technological ecosystems [31] in the area.

Furthermore, it provides a research method adequate to analyze project databases with a systematic procedure as well as mapping projects. The process involves four stages: study definition, screening definition, projects' selection, and analysis. At this stage the three first steps have been finished. Presently the scope of the projects has been analyzed as well as the analysis of the summaries and outputs of the projects. Besides the contacts of the projects of interest have been gathered. Additionally, a survey has been developed and applied to get more data regarding the reasons for their success. The survey was designed to gather more detailed information on key aspects of the projects regarding their degree of success and the ICT tools used.

Table 1: Survey questions

Section	Question code	Question	Description
Identification	Q0001	Project number	Open question with a pattern
	Q0002	Institution name	Open question
	Q0003	Contact email	Open question with a pattern
Global project aspects	Q0004	What do you consider to be the factors that have led to the project being classified as good practice and / or successful story?	14 Dichotomous options and 1 open question (other)
	Q0005	What have been the main results of the project in relation to electronic learning (eLearning, ICT)?	7 Dichotomous options and 1 open question (other)
Students and ICT	Q0006	What level are the students who have participated in the project? (select all that apply)	6 Dichotomous options and 1 open question (other)
	Q0007	What ICT tools does the project use to improve student learning?	13 Dichotomous options and 1 open question (other)
	Q0008	Type of ICT devices have the students used in the Project	12 Dichotomous options and 1 open question (other)
Teachers and ICT	Q0009	At what educational level were working the teachers involved in the project?	8 Dichotomous options and 1 open question (other)
	Q0010	What ICT tools did the teachers involved in the Project use?	18 Dichotomous options and 1 open question (other)
	Q0011	Type of ICT devices used by the teachers involved in the Project?	12 Dichotomous options and 1 open question (other)
	Q0012	What ICT training activities are carried out within the Project?	6 Dichotomous options and 1 open question (other)
Other project aspects	Q0013	In addition to teachers or students from educational centers, what other types of personnel have participated in the project?	8 Dichotomous options and 1 open question (other)
	Q0014	Apart from the activities related to the use of ICT to improve learning, what other types of activities have been carried out in the project?	14 Dichotomous options and 1 open question (other)
	Q0015	What dissemination activities have you developed in the project?	14 Dichotomous options and 1 open question (other)
	Q0016	What future plans do you have in relation to the project?	14 Dichotomous options and 1 open question (other)
	Q0017	What has been the cost-benefit balance of participation in the project?	6 Dichotomous options and 1 open question (other)
	Q0018	What obstacles do you consider that could prevent the continuity of use and improvement of the results, as well as further research on the project's theme?	3 Dichotomous options and 1 open question (other) – single question
	Q0019	To what extent have the results and products you achieved with this project helped to better cope with education during the COVID-19 pandemic?	3 Dichotomous options and 1 open question (other)
Conclusions	Q0020	Could you summarize in two sentences the aspects that have worked and continue to work very well in the project and that are the key to its success?	Open question
	Q0021	Could you indicate in two sentences what would improve the project?	Open question

[a] Questions and description of the options.

At this moment the phase of reviewing the answers provided by the participants in the survey is being developed.

The design of the survey has been based on theories of questionnaire design from different publications in which there are a definition of the types of open or closed questions, the methodology, the way of writing the questions in a clear language grouped and in order, a recommended number of questions [32–34]. As a result of that the survey is divided into 6 sections: Identification, Global project aspects, Students and ICT, Teachers and ICT, other project aspects related to other areas of the projects regarding the use and sustainability of the results achieved from the projects, among other things, and finally the main conclusions. The survey has a maximum length of 21 questions with dichotomous and open sub-questions for an average time of 20 minutes.

As a source of inspiration several questionnaires have been reviewed, as it is the case of ICT the questionnaires of International Computer and Information Literacy Study (ICLS) [9, 10], the OECD PISA Global Crises Questionnaire Module [34] and Teaching and Learning International Survey (TALIS) [35]. Table 1 shows the questions included in the survey.

6 RESULTS TO DATE AND THEIR VALIDITY

The steps followed so far include mapping the projects based on specific criteria already defined [26, 27] and described below:

- They should be linked with the term eLearning/e-Learning (almost 10,000 projects).
- Only projects labelled as good practice or success story are chosen (almost 1,200 projects).
- Key actions KA1 and KA2 are the ones in which educational centers are more focused, so only those actions have been considered.
- The interest is mainly in those projects in which educational centers are involved because those are an important element for analyzing the improvement in the learning process. Hence, those project that didn't involve educational centers were excluded.

The number of projects meeting the first three requirements have been 1,144 projects, of which 256 did not have any educational centers.

Once the projects that matched those criteria were filtered, the contact information was compiled using the data available on the Erasmus+ Results Platform [24] or on the coordinators and/or partners websites. There were 39 projects for which it was not possible to find a contact email. Hence the total amount of institutions contacted were 849. Afterwards, the questionnaire was sent to all those contacts.

Finally, responses for 187 projects have been got. Therefore, the response rate has been of 22%.

7 DISSERTATION STATUS

The current situation of research is that of analysis of the data collected through the survey designed to better understand the key aspects of the European educational projects that have been successful.

The results of the different sections of the questionnaire are being analyzed and conclusions are drawn that may serve as inspiration for future research or projects.

8 CURRENT AND EXPECTED CONTRIBUTIONS

This Doctorate program is being developed within the framework of the Education in the Knowledge Society Ph.D. Programme at the University of Salamanca (Spain) [36–38] with a portal that serves as the primary tool for giving support to communications and visibility of its progress [39, 40]. Additionally, this work is being implemented within the GRIAL Group of the University of Salamanca [41, 42], so all the outcomes will be accessible openly [43, 44].

At this moment, two articles [1, 26] and a chapter [27] have been published and four articles will be presented, including this one, for different conferences: V Simposio Internacional de Informática Educativa (SIIE), IX International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'21) and XI International Conference on Virtual Campus (JICV'21).

9 CONCLUSIONS

The work presented on this paper shows the selection of Erasmus+ educational projects classified as good practice and connected with ICT and / or eLearning. The survey designed to collect information and applied in this selection of projects is also described. The analysis of those data would help to understand the factors that have led to the success of the projects.

Regarding the administration of the survey the contact details of the project coordinators collected from the platform and their websites were used. At the same time, project summaries, as well as their outcomes were gathered to get as much information as possible. The survey response rate has been of 22%, which is suitable for obtaining data of interest on projects.

The analysis of the data would allow to provide a guidance to teachers and teacher trainers to know the key factors for a good design of educational projects as well as an optimal use of ICT resources and a real impact on the teaching-learning process.

Finally, there are two papers and a chapter published throughout the research period under the umbrella of the GRIAL Group of the University of Salamanca [36, 37], and four more papers ongoing.

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REFERENCES

[1] M.G. Alonso de Castro, F. J. García-Peñalvo. 2020. Methodological guide for the successful use of digital technologies in education: Improvement of learning through European educational projects. In Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'20), October 21-23, 2020, Salamanca, Spain. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3434780.3436549

[2] Charles Hodges, Stephanie Moore, Barb Lockee, Torrey Trust, and Aaron Bond. 2020. The difference between emergency remote teaching and online learning. In Educause Review.

[3] F. J. García-Peñalvo, "Digital Transformation in the Universities: Implications of the COVID-19 Pandemic," Education in the Knowledge Society, vol. 22, 2021, Art no. e25465, doi: 10.14201/eks.25465.

[5] F. J. García-Peñalvo and A. Corell. 2020. La COVID-19: ¿enzima de la transformación digital de la docencia o reflejo de una crisis metodológica y competencial en la educación superior? Campus Virtuales 9, 2.

[5] F. J. García-Peñalvo, A. Corell, V. Abella-García, and M. Grande-De-Prado. 2020. Online Assessment in Higher Education in the Time of COVID-19. Education in the Knowledge Society 21. DOI:10.14201/eks.23013.

[6] M. Grande-De-Prado, F. J. García-Peñalvo, A. Corell, and V. Abella-García. 2021. Evaluación en Educación Superior durante la pandemia de la COVID-19. Campus Virtuales 10, 1, 49-58.

[7] R. Gil-Fernández, A. León-Gómez, and D. Calderón-Garrido. 2021. Influence of COVID on the Educational Use of Social Media by Students of Teaching Degrees. *Education in the Knowledge Society* 22. DOI:10.14201/eks.23623.

[8] H. Fardoun, C. S. González-González, C. A. Collazos, and M. Yousef. 2020. Estudio exploratorio en Iberoamérica sobre procesos de enseñanza-aprendizaje y propuesta de evaluación en tiempos de pandemia. Education in the Knowledge Society 21. DOI:10.14201/eks.23437.

[9] Julian Fraillon, John Ainley, Wolfram Schulz, Tim Friedman and Eveline Gebhardt. 2014. Preparing for life in a digital age: The IEA International Computer and Information Literacy Study International Report. Springer, Cham, Switzerland. DOI: 10.1007/978-3-319-14222-7

[10] Julian Fraillon, John Ainley, Wolfram Schulz, Tim Friedman, and Daniel Duckworth. 2020. Preparing for Life in a Digital Age. IEA International Computer and Information Literacy Study 2018 International Report. Springer, Cham, Switzerland. DOI: 10.1007/978-3-030-38781-5

[11] I. Aznar Díaz, M. P. Cáceres Reche, and J. M. Romero Rodríguez. 2018. Indicadores de calidad para evaluar buenas prácticas docentes de «mobile learning»en Educación Superior. *Education in the Knowledge Society* 19, 3, 53-68. DOI:10.14201/eks20181935368.

[12] EU. 2021. European Union. Erasmus+. Retrieved from: https://ec.europa.eu/programmes/erasmus-plus/node_es

[13] EU. 2021. European Union. Erasmus+ Programme Guide. Retrieved from: https://ec.europa.eu/programmes/erasmus-plus/resources/programme-guide_en

[14] E. Crisol-Moya, L. Herrera-Nieves, and R. Montes-Soldado. 2020. Educación virtual para todos: una revisión sistemática. Education in the Knowledge Society 21. DOI:10.14201/eks.20327.

[15] J. L. Fuentes, J. E. Albertos, and F. Torrano. 2019. Towards the Mobile-Learning in the School: Analysis of Critical Factors on the Use of Tablets in Spanish Schools. Education in the Knowledge Society 20. DOI:10.14201/eks2019_20_a3.

[16] O. Turpo-Gebera and A. Hurtado-Mazeyra. 2019. Scientific Productivity on Blended Learning in Peru: Approaches to its Evolution from University Theses. Education in the Knowledge Society 20. DOI:10.14201/eks2019_20_a19.

[17] L. Delgado. 2019. Joint Programmes and Degrees in the European Higher Education Area. Education in the Knowledge Society 20. DOI:10.14201/eks2019_20_a20.

[18] M. Liebherr, P. Schubert, S. Antons, C. Montag, and M. Brand. 2020. Smartphones and attention, curse or blessing? - A review on the effects of smartphone usage on attention, inhibition, and working memory. Computers in Human Behavior Reports 1. DOI:10.1016/j.chbr.2020.100005.

[19] A. J. Berlanga, F. J. García-Peñalvo, and P. B. Sloep. 2010. Towards eLearning 2.0 University. Interactive Learning Environments 18, 3, 199-201. DOI:10.1080/10494820.2010.500498.

[20] F. J. García Peñalvo and A.M. Seoane Pardo. 2015. Una revisión actualizada del concepto de eLearning. Décimo Aniversario. Education in the Knowledge Society, 16(1), 119144. DOI: http://dx.doi.org/10.14201/eks2015161119144

[21] B. Gros and F.J. García Peñalvo. 2016. Future trends in the design strategies and technological affordances of elearning. In M. Spector, B. B. Lockee, and M. D. Childress (Eds.), Learning, Design, and Technology. An International Compendium of Theory, Research, Practice, and Policy (pp. 123). Switzerland: Springer International Publishing.

[22] F. J. García Peñalvo. 2020. Modelo de referencia para la enseñanza no presencial en universidades presenciales. Campus Virtuales, vol. 9, no. 1, 2020.

[23] F. J. García-Peñalvo. 2020. Learning Analytics as a Breakthrough in Educational Improvement. In Radical Solutions and Learning Analytics: Personalised Learning and Teaching Through Big Data, D. Burgos Ed. Springer Singapore, Singapore, 1-15. DOI:10.1007/978-981-15-4526-9_1.

[24] F. J. García-Peñalvo. 2021. Avoiding the Dark Side of Digital Transformation in Teaching. An Institutional Reference Framework for eLearning in Higher Education. Sustainability 13, 4. DOI:10.3390/su13042023.

[25] EU. 2021. European Union. Erasmus+ Projects Results Platform. Retrieved from: https://ec.europa.eu/programmes/erasmus- plus/projects/

[26] M.G. Alonso de Castro, F. J. García-Peñalvo. 2020. Overview of European educational projects on eLearning and related methodologies: Data from Erasmus+ Project Results Platform. In Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'20), October 21–23, 2020, Salamanca, Spain. ACM, New York, NY, USA, 8 pages. https://doi.org/10.1145/3434780.3436550.

[27] M. G. Alonso de Castro and F. J. García-Peñalvo. 2021. Erasmus+ Educational Projects on eLearning and Related Methodologies: Data From Erasmus+ Project Results Platform. In F. J. García-Peñalvo (Ed.), Information Technology Trends for a Global and Interdisciplinary Research Community (pp. 111-133). IGI Global. http://doi:10.4018/978-1-7998-4156-2.ch006

[28] A. García Holgado, S. Marcos Pablos, R. Therón and F. J. García Peñalvo. 2019. Technological ecosystems in the health sector: A mapping study of European research projects. *Journal of Medical Systems, vol. 43*, art. 100, 2019. DOI:10.1007/s10916-019-1241-5

[29] A. García Holgado, S. Marcos Pablos and F. J. García-Peñalvo. 2020. Guidelines for performing Systematic Research Projects Reviews. *International Journal of Interactive Multimedia and Artificial Intelligence, 6*(2), 136-144. DOI:10.9781/ijimai.2020.05.005

[30] J. Meneses, D. Rodríguez-Gómez. 2011. *El cuestionario y la entrevista*. Barcelona: Universitat Oberta de Catalunya. https://femrecerca.cat/meneses/publication/cuestionario-entrevista

[31] F. J. García-Peñalvo, Á. Hernández-García, M. Á. Conde, Á. Fidalgo-Blanco, M. L. Sein-Echaluce, M. Alier-Forment, F. Llorens-Largo, and S. Iglesias-Pradas. 2017. Enhancing Education for the Knowledge Society Era with Learning Ecosystems. In Open Source Solutions for Knowledge Management and Technological Ecosystems, F.J. García-Peñalvo and A. García-Holgado Eds. IGI Global, Hershey PA, USA, 1-24. DOI:10.4018/978-1-5225-0905-9.ch001.

[32] L. Fernández Núñez, L. 2007. ¿Cómo se elabora un cuestionario? Butlletí LaRecerca. Retrieved from: de: http://www.ub.edu/ice/recerca/pdf/ficha8-cast.pdf

[33] F. García Alcaraz, A. Alfaro Espín, A. Hernández Martínez, M. Molina Alarcón. 2006. Diseño de Cuestionarios para la recogida de información: metodología y limitaciones. *Revista Clínica de Medicina de Familia [en linea]. 2006, 1*(5), 232-236.

[34] J. Bertling, *et al.* 2020. A tool to capture learning experiences during Covid-19: The PISA Global Crises Questionnaire Module, OECD Education Working Papers, No. 232, OECD Publishing, Paris, https://doi.org/10.1787/9988df4e-en

[35] OCDE. 2020. Teaching and Learning International Survey (TALIS). Retrieved from: http://www.oecd.org/education/talis/

[36] F. J. García Peñalvo. 2014. Formación en la sociedad del conocimiento, un programa de doctorado con una perspectiva interdisciplinar. *Education in the Knowledge Society, 15*(1), 4-9.

[37] F. J. García-Peñalvo. 2013. Education in knowledge society: A new PhD programme approach. In Proceedings of the First International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'13) (Salamanca, Spain, November 14-15, 2013), F.J. García-Peñalvo Ed. ACM, New York, NY, USA, 575-577. DOI:10.1145/2536536.2536624.

[38] F. J. García-Peñalvo, A. García-Holgado, and M. S. Ramírez-Montoya. 2020. Introduction for the TEEM 2020 Doctoral Consortium track. In Proceedings TEEM'20. Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality (Salamanca, Spain, October 21st - 23rd, 2020), F.J. García-Peñalvo Ed. ACM, New York, NY, USA. DOI:10.1145/3434780.3436704

[39] A. García Holgado, F.J. García Peñalvo and M.J. Rodríguez Conde. 2015. Definition of a technological ecosystem for scientific knowledge management in a PhD Programme. In G. R. Alves and M. C. Felgueiras (Eds.), Proceedings of the Third International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'15) (Porto, Portugal, October 7-9, 2015) (pp. 695-700). New York, NY, USA: ACM.

[40] F. J. García Peñalvo, M.J. Rodríguez Conde, S. Verdugo Castro and A. García Holgado. 2019. Portal del Programa de Doctorado Formación en la Sociedad del Conocimiento. Reconocida con el I Premio de Buena Práctica en Calidad en la modalidad de Gestión. In A. Durán Ayago, N. Franco Pardo, and C. Frade Martínez (Eds.), Buenas Prácticas en Calidad de la Universidad de Salamanca: Recopilación de las I Jornadas. REPOSITORIO DE BUENAS PRÁCTICAS (Recibidas desde marzo a septiembre de 2019) (pp. 39-40). Salamanca, España: Ediciones Universidad de Salamanca.

[41] F. J. García Peñalvo, M.J. Rodríguez Conde, R. Therón, A. García Holgado, F. Martínez Abad and A. Benito Santos. 2019. Grupo GRIAL. IE Comunicaciones. Revista Iberoamericana de Informática Educativa (30), 3348.

[42] Grupo GRIAL. 2019. Producción Científica del Grupo GRIAL de 2011 a 2019(GRIALTR2019010). Salamanca, España: Grupo GRIAL, Universidad de Salamanca. Retrieved from https://repositorio.grial.eu/bitstream/grial/1624/1/GRIAL-TR-2019-010.pdf

[43] F. J. García-Peñalvo, C. García De Figuerola, and J. A. Merlo-Vega. 2010. Open knowledge management in higher education. Online Information Review 34, 4, 517-519.

[44] M.S. Ramírez Montoya, F.J. García Peñalvo and McGreal, R. 2018. Shared Science and Knowledge. Open Access, Technology and Education. Comunicar, 26(54), 1-5

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