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DEVELOPMENT OF BASIC COMPETENCES OF STUDENTS IN HIGHER EDUCATION THROUGH LEARNING ORIENTED e-ASSESSMENT

[Desarrollo de las competencias básicas de los estudiantes de educación superior mediante la e-Evaluación orientada al aprendizaje]

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Abstract

Learning Oriented e-Assessment (e-LOA) is an ICT mediated learning process. It promotes the development of competences that are relevant to both students' academic present and professional future. In this quasi-experimental research a pretest-posttest design with experimental and control groups is implemented. We believe that the actions of e-LOA favors further development of competences. The results show that in the experimental groups there is an improvement on the level of competence. Significant differences have been found between the pretest and posttest. In addition, there is a consistency between the competences that have improved and those considered in the literature (creativity, problem solving ...).

Keywords

Learning Oriented Assessment, e-Assessment, basic competences, Higher Education.

Resumen

La e-Evaluación orientada al aprendizaje (e-EOA) es un proceso de aprendizaje, mediado por las TIC, que promueve el desarrollo de competencias útiles para el presente académico y el futuro laboral de los estudiantes. En esta investigación cuasi-experimental, con diseño pretest-postest con grupos experimentales y de control, consideramos que las actuaciones de la e-EOA (VI) favorecen un mayor desarrollo de competencias (VD). Los resultados revelan que en los grupos experimentales se mejora el nivel competencial y existen diferencias significativas entre su pretest-postest. Además, se comprueba que las competencias que mejoran son coherentes con la teoría planteada (creatividad, resolución de problemas…).

Descriptores

Evaluación orientada al aprendizaje, e-Evaluación, competencias básicas, Educación Superior.

Introduction

Assessment, can, in itself, be considered as an opportunity to promote significant formation and to develop competences in university students (Bordas and Cabrera, 2001). The orientation of learning assessment (Carless, 2002; Boud and Falchikov, 2006; Padilla Carmona and Gil Flores, 2008; Rodríguez Gómez and Ibarra Sáiz, 2011) should imply an effective renovation in the practice and approach to assessment in Higher Education in order to respond to the new academic, social and labour expectations and demands (Boud, 2010).

Learning Oriented e-Assessment (e-LOA) has emerged in the university as an educational proposal which will make it possible to respond to the new social and professional

contexts of the 21st Century. A context, focused on the development of competences (Rué Domingo, 2008; Ibarra Sáiz, Rodríguez Gómez and Gómez Ruiz, 2010) which has ousted the traditional acquisition of knowledge from the centre of educational interest. This makes it necessary to review and reflect on assessment practices in higher education from this new perspective, given the close relationship between teaching methods, educational goals and assessment.

Moreover, the influence of Information and Communication Technologies (ICT), is increasingly more notable in the area of education and society in general. To exclude these technologies from the current university learning process or to underestimate their educational potential would significantly undermine the importance of the activity of students who are becoming more and more accustomed to the use of ICT for purposes of communication, information or amusement, as well as increasing the technological breach between teaching staff and students.

E-LOA becomes a reality in the educational process through the implication of the students in assessment activities, creative and realistic tasks and the production of information which will be useful in the student's academic present and professional future In fact, and as has been demonstrated in different works (Rodríguez Gómez, Ibarra Sáiz and Gómez Ruiz, 2012), student participation in the assessment process makes it possible to develop different basic competences such as critical thinking, the application of knowledge to problem solving, communication and negotiation or the deepening of awareness regarding the ethical sense of one's own actions.

Thus, in the present research, we approach the repercussions which may result from the application of an e-LOA methodology to the basic academic and professional competences of university students. In order to do this, several groups of students in which e-LOA related practices are carried out were compared with other groups in which they are not systematically employed. To be precise, and based on specialised literature, the development of current legislation, the reference framework of the Tuning Project (González and Wagennaar, 2003) and the Dublin descriptors (JQI, 2004), in this study we centre on gathering and comparing the impact of e-LOA on ten basic academic and professional competences: application of knowledge, appraisal, problem solving, analysis of information, communication, independent learning, ethical sense, creativity, teamwork and assessment.

Conceptual framework for learning oriented e-Assessment

The framework of reference for learning orientated assessment (Carless, Joughin and Liu, 2006) establishes three basic requirements for assessment to focus on the lifelong development of valuable learning. The said requirements are:

- Assessment tasks should be considered as learning tasks
- Feedback must become generalizable feedback or feedforward.
- Students must be actively involved in assessment

The perspective and components of learning oriented assessment have been revised and put into context, taking into account the importance and influence of virtual learning, thus obtaining the conceptual framework for e-LOA shown in detail in Figure 1 and which we develop below.

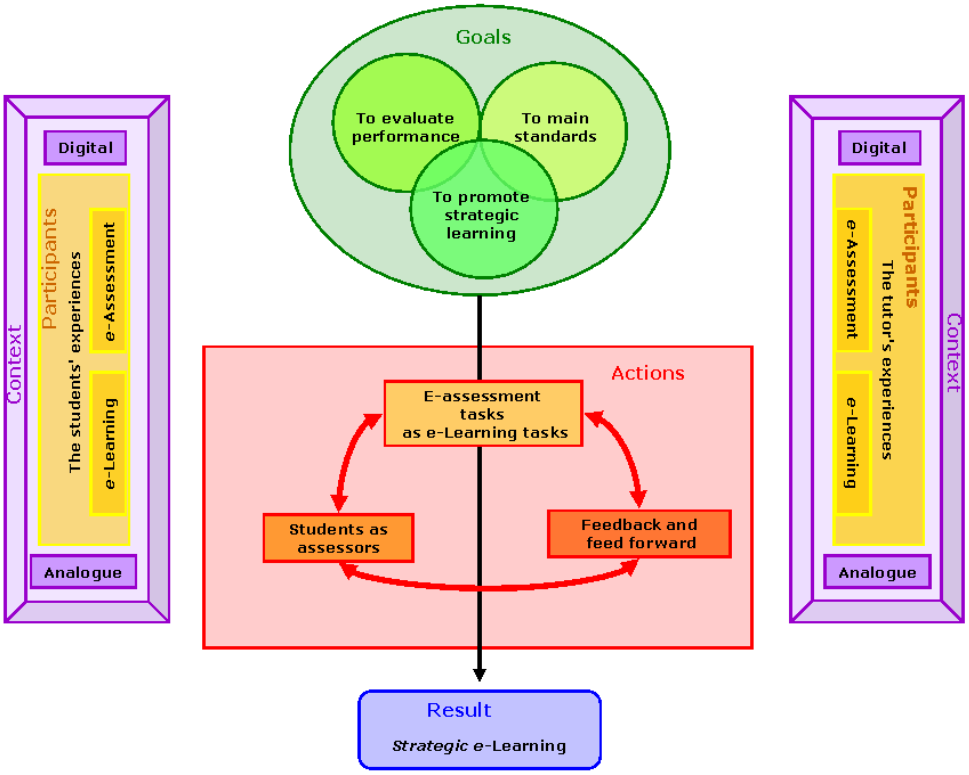

Figure 1.- Conceptual framework for learning oriented e-Assessment Adapted from: Rodríguez Gómez et al. (2009:516).

Goals and results of e-LOA

The teleological framework of e-LOA comprises three interrelated goals:

1. University assessment must be a systematic activity aimed at evaluating student performance in order to improve the development of their competences.
2. University assessment must be based on a comparison between the students' competences and academic, social and professional demands or standards.
3. The aim and expected result of e-LOA is to promote strategic learning, i.e., acquiring transferable strategies which will encourage independent learning, decision making and the construction of a self-regulated learning process (Pozo Municio and Monereo Font, 2002; Zimmerman, 2002).

E-LOA activities

These activities form the crux of e-LOA, since this defines the components which reflect the operational format of the assessment process.

The first step is to consider the *students as assessors* within e-LOA. Students are not now a passive object of assessment; they have become involved and are an active element in assessment tasks, both as regards their own work and that of their peers. This converts assessment into an important tool for the development and promotion of different competences. The main evaluation methods in which students are involved are self-assessment (Rodríguez Gómez, Ibarra Sáiz and Gómez Ruiz, 2011), peer-assessment (Ibarra Sáiz, Rodríguez Gómez and Gómez Ruiz, 2012) and co-assessment (assessment carried out jointly by the student and teaching staff) and are used as student teaching tools, as long as they are coherent with the goals of e-LOA.

Secondly *e-Assessment tasks are e-Learning tasks*. E-LOA integrates assessment into the student's learning process by proposing tasks

which require a creative response (Borootchi and Keshavaraz, 2002) and, above all, by carrying out real tasks, i.e, realistic tasks which demand that the students carry out the same combination of knowledge, competences or abilities and attitudes that they must be able to demonstrate later on, during their professional career (Gulikers, Bastiaens and Kirschner, 2005).

The final action is to convert *feedback into feedforward*. The adequate provision, in time and form, of feedback is of fundamental importance for the consolidation of the learning process, as it makes assessment *sustainable* (Boud, 2000), since it supports the self-regulation of the student's work independently of teaching staff (Nicol and MacFarlane-Dick, 2006; Carless et al., 2011). Taking a step beyond, the current objective is to provide feedforward, as an action which provides useful information, not only for present performance but also for its generalization to future academic and labour tasks (Carless, Joughin and Mok, 2006).

E-LOA context and participants

All of these actions are included within a context in which the incorporation of ICT to the university teaching-learning process is being established and enriched. With the passage of time, the "virtual campuses" or "digital classrooms" used in university education, based on the use of learning management systems (LMS) such as Moodle (Modular Object-Oriented Dynamic Learning Environment), Blackboard or LAMS (Learning Activity Management System) are gaining importance.

Taking into account the importance of ICT, we have currently progressed from assessment to e-Assessment (Olmos Migueláñez and Rodríguez Conde, 2011), which is generically understood to be any electronic assessment process where ICT is used for the presentation or carrying out of assessment activities and tasks and the recording of answers, be it from the perspective of students, tutors, institutions or the general public (JISC, 2007).

But not only have the number of learning oriented teaching hours and digital resources been increased, but there has also been a diversification of their use. It has progressed from being a mere (virtual repository) to the web 2.0 and the use of wikis, blogs, social networks, simulations and videogames (Moreno Ger et al., 1009; Rodríguez Gómez, 2009).

Nevertheless, this growing reality also poses certain problems, such as the probable existence of a technological breach or gap between the students' *(digital natives)* own experiences and characteristics and those of the teaching staff (*digital immigrants*) (Prensky, 2001). This is an important aspect to be taken into consideration when deploying this educational practice, given that socialisation, the building of personality and strategies for approaching reality vary considerably from one case to the other.

Study objectives and hypothesis

The main objective of this study is to evaluate the impact of the use and putting into practice of the principles and actions of learning oriented e-Assessment for the development of academic and professional competences of university students in the area of Social Sciences.

Our specific intention is to evaluate the impact of learning oriented e-Assessment by putting it into practice, followed by its analysis, comparing it with another group in which e-LOA related actions have not be applied.

In order to achieve our objective the hypothesis we proposed was that the putting into practice of learning oriented e-Assessment actions (independent variable) promotes greater development of academic and professional competences (dependent variable) in university students than the traditional teaching methods based on expositions and a final exam.

Method

Procedure

A quasi-experimental research was designed and implemented in order carry out the validation of our hypothesis. This followed a pre-test-post-test design, which included experimental and control groups. The incorporation of the principles and actions of e-LOA into the university teaching-learning process was taken to be the independent variable, the dependent variable being the students' perception of the level of the development of their basic competences.

The pre-test was carried out at the beginning of the first semester of the 2009-2010 academic year, and the post-test at the commencement of the second, once the teaching activity in the subjects included in the research was concluded. A survey was carried out to measure the dependent variable using the COMPES face-to-face questionnaire[1]: "A self-report of university students' basic competences", (Gómez Ruiz, Rodríguez Gómez and Ibarra Sáiz, pending publication) designed for this purpose.

As regards the independent variable, different learning and assessment tasks where designed and developed for the four subjects which served as experimental groups, following the basic requirements of e-LOA. To be specific, the development of the assessment of the subjects taken by the experimental groups included the following fundamental characteristics:

- It required the continuous work of the students by means of different tasks distributed over the academic year. These included trials and even the realisation of case studies.
- The core of the subjects was based on tutored learning projects. Depending on the subject, the students had to carry out, as a group, a research or educational diagnosis project applicable to educational reality. This methodology promotes the students' responsibility as regards their own learning process by carrying out a project which requires the use of prior knowledge, documentary skills and the management of conflicts in professional contexts (Gil Flores et al., 2004). Moreover, this is a practice which, together with case analysis and problem based learning, especially lends itself to their development through the use of virtual resources (Cabero Almenara and Román Graván, 2006).
- The students carried out some activity or another as assessors, reflecting on their own work and that of their classmates, using explicit criteria and contributing justification and feedforward.
- The teaching staff provided the necessary feedforward for the development of assessment tasks, especially during the progressive creation of the tutored projects.
- The majority of tasks, including tutored projects, were carried out, to a greater or lesser extent, with the support of ICT and, specifically, the use of Moodle LMS and LAMS installed in the Virtual Campus of the University of Cadiz. In addition, a WebQuest, adapted to the realization of the tutored projects, was also used to carry out tutored projects (Gómez Ruiz et al., 2010), as well as other virtual resources necessary to support the development of the proposed activities.

The control groups were selected from amongst four groups of students who were studying subjects where there was no predominance of e-LOA characteristics and which, generally speaking, were included within a dynamic which we could consider as *traditional teaching methods*, i.e., those based on presentations, the occasional use of ICT and whose main method of assessment is the final exam, this being the most common situation in universities, as has been demonstrated in other studies (Ibarra Sáiz, 2007).

Sample

The participants in both the experimental and control groups were selected by means of

a non-probalistic and intentional sample, using principles of accessibility and representativity. In both cases the groups belonged to the branch of Social and Legal Sciences.

Characteristics of the experimental groups

The 4 experimental groups (EG) were reading a Degree in Psychopedagogy at the University of Cadiz (Spain). To be more precise, the study was centred on the obligatory subjects Educational Research Methods (ERM) imparted during the 4th year and Educational Diagnosis (ED) in the 5th, in both their full time and part time attendance modes.

In the part time attendance mode students were only required to attend classes in person once every two weeks, while, in the full time attendance mode they were required to attend two classes of the subject per week (attended sessions lasted two hours in all cases). ITC were used in the academic activity of both modes, using the Virtual Campus based on Moodle and other complementary virtual resources.

The students included in the full time attendance mode were more homogeneous. The majority were young people who had just finished their first cycle studies. On the other hand, there was more heterogeneity within the part time attendance mode, which included a considerable number of participants with professional experience, more than 20 years as infant or primary teachers. In both the full time and part time attendance modes, all of the participants were in possession of a Teaching diploma in one of there specialities, given that a Degree in Psychopedagogy is only obtained after completing the second cycle.

Characteristics of the control groups

Those taking part in the 4 control groups (CG) were studying a Business Management Degree, also at the University of Cadiz. The students belonged to the same levels as the experimental groups: 2 groups in the 4th year and another two groups in the 5th year. In this case, all the group control participants were full time degree students, the majority of whom were already in possession of a Diploma in Business Studies.

Analysis of the sample

Table 1 shows all the details of the research informants, separated into groups and by the type of test.

Table 1. -Research participants by groups and type of test.

		Pre-test						Post-test					
Groups	**Code**	**Men**		**Women**		**TOTAL**		**Men**		**Women**		**TOTAL**	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Experimental	EG 1	13	1.,31	58	81.69	71	32.42	12	20	48	80	60	35.71
	EG 2	17	36.17	30	63.83	47	21.46	11	33.33	22	66.67	33	16.64
	EG 3	13	23.64	42	76.36	55	25.11	14	25.45	41	75.55	55	32.74
	EG 4	16	34.78	30	65.22	46	21	5	25	15	75	20	11.9
TOTAL		**59**	**26.94**	**160**	**73.06**	**219**	**100**	**42**	**25**	**126**	**75**	**168**	**100**
Control	CG 1	22	44	28	56	50	25.91	21	50	21	50	42	26.25
	CG 2	27	45	33	55	60	31.09	20	37.74	33	63.26	53	33.13
	CG 3	14	32.56	29	67.44	43	22.28	12	35.29	22	64.71	34	21.25
	CG 4	14	35	26	65	40	20.73	11	35.48	20	64.52	31	19.38
TOTAL		**77**	**39.9**	**116**	**60.1**	**193**	**100**	**64**	**40**	**96**	**60**	**160**	**100**

As can be seen in Table 1, the pre-test included data collected from 219 students included in the experimental groups and 193 in the control groups, giving a total of 412 subjects in this phase of the study. On the other hand, 168 students from the experimental groups and 160 from the control groups took part in the post-test, i.e. a total of 328. As can

be appreciated, there was a loss of information from 84 included in the study sample, probably due to the normal decrease of student attendance during classes at university.

If we divide the participants in experimental groups by mode we can observe that the students in the full time attendance mode (Table 1 codes: EG 1 and EG 3) make up 57.53% of the pre-test and 68.45% of the post-test total.

With regards to sex, there is a clear predominance of women, both in the control groups and, especially, in the experimental groups. They represent a 60% of both the pre-test and post-test, and this percentage increases in the experimental groups up to 73.06% in pre-test and 75% in post-test situations.

In addition, it is important to underline that it has been possible to carry out a cross-sectional follow-up of 272 students, 129 from the experimental groups and 143 from the control groups. It was not possible to carry out a follow-up of the rest of sample, either because they did not carry out both test or, because in the pre-test and post-test, they did not correctly identify themselves. Finally, it should be pointed out that, in all cases, participation in data collection was completely voluntary.

Instruments

Dependent variable

The COMPES questionnaire (Gómez Ruiz, Rodríguez Gómez and Ibarra Sáiz, pending publication) was designed and used for the collection of data regarding the dependent variable (development of the students' academic and professional competences). Its aim is to collect information concerning the level of competence perceived by students regarding the development of a group of competences, identified as being basic, and which are brought into play by means of student participation in the evaluation process. The COMPES self-report was designed and validated (apparent validation through the opinion of experts and validation of the content in a pilot study) in the context of the Re-Evalúa research project[2]. On the other hand, the reliability of the items of the questionnaire for the sample taking part in this study was calculated, by means of Cronbach's alpha, to be 0.944. which means that the instrument can be considered to be very reliable.

When designing the COMPES questionnaire the self-report technique was opted for as the method for assessing competences in order to gather the students' perception of their own level of competence. The perceived competence is related to metacognition and the building of knowledge (Baartman and Ruijs, 2011), as it encourages reflection on the weaknesses and strengths of one's own capacities oriented towards self-regulated learning. The completion of the self-report can, in itself, be considered as a learning activity related to the theoretical and practical framework of learning oriented e-Assessment.

The COMPES Self-report comprises 37 randomly ordered statements concerning actions related to ten basic competences, i.e., each competence has 3 or 4 associated items in the questionnaire. The competences are: Application of knowledge, appraisal, problem solving, and analysis of information, communication, independent learning (learning to learn), ethical sense, creativity, teamwork and assessment. Each statement was accompanied by a scale of from 1 to 6 to rate the frequency with which each action was carried out (1 = never, 2 = not often, 3 = sometimes, 4 = quite often, 5 = very often and 6 = always). The instrument was completed by fields for the identification of the participants and brief instructions for filling it out correctly. It was estimated that it would take from 10 to15 minutes to complete.

Independent variable

Different techniques and instruments were used in the experimental and control groups to verify and record the application of learning oriented e-Evaluation (independent variable) actions to the learning process.

Experimental groups

Group interviews with students. Eight group interviews (two per subject) were carried out half way through the experience and once it had been completed. 8 subjects took part in each, which means that 32 students were interviewed twice.

Interviews with teaching staff. Two interviews were carried out with each member of the teaching staff in charge of the subjects included in the e-LOA. One was carried out during the course and the other on completion of the same.

Field diary: In addition, observations noted down in a diary about the follow up of the general experience and interactions with the other participants were also used.

Control groups

Group interviews with students. Three of the four control groups (a total of 26 student informants) were interviewed once the first semester of their subjects had been completed.

Interviews with teaching staff. Prior to the pre-test an interview was carried out with each member of the teaching staff responsible for the reference subjects used as control groups.

Data analysis

The pre-test and post-test data collected by the COMPES self-report from the different experimental and control groups was used to build a data matrix with the software Statistical Package for the Social Sciences (SPSS) version 15.

Firstly, several basic descriptive analyses were carried out by items, competences and groups using statistical calculations such as frequencies, means, and minimum and maximum standard deviations. Secondly, the lost values were replaced with mean of their series, thus completing 55 of the missing data (0.2%). In the third place the *total index of the questionnaire* - sum of the rating of all the items of the self-report- and the *index by competence* - sum of the rating of the items grouped by competences-, were calculated. Fourthly, Levene's Test of Equality of Error Variance was carried out in order to check for the possible existence of internal differences between the different experimental and pre and post-test control group. Finally, Student's T-test was carried out on two samples to check for the possible existence of significant differences between total indices of the different analysis groups and the pre and post-test index by competence. All the contrasts were carried out with a 1% significance value.

Results

Differences between pre and post-test descriptive analysis

First of all, we compared the descriptive analysis of the pre and post-tests results of the control and experimental groups.

Bearing in mind the mean rating given to each of the 37 items of the pre and post-test COMPES self-report, we observed, as shown in Figure 2, that the averages of the experimental groups improve in 34 of the 37 actions, representing 91.90% of the same, while only 14 (37.84%) increased in the control groups and there was a decrease in a total of 22 items (59.46%).

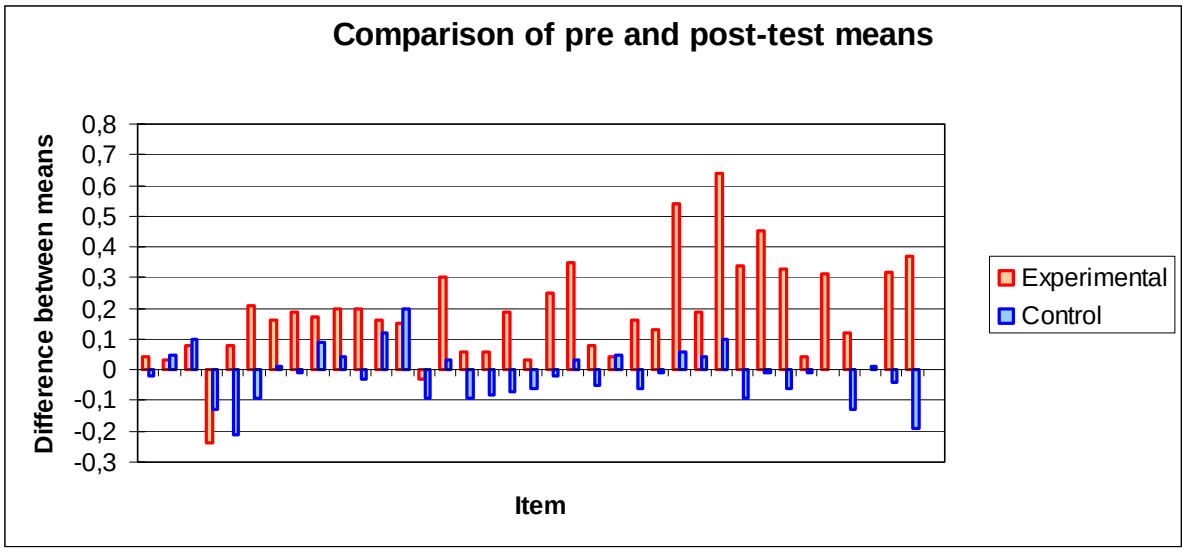

Figure 2.- Comparison of the means of the pre and post-test items (actions) in the self-reports of the experimental and control groups.

It has also been shown that the overall mean of the answers given by the experimental groups went from 4.5 in the pre-test to 4.7 in the post-test, while in the control groups the average was maintained at 4.4.

The results obtained seem to indicate that, the perception of students in the experimental groups, of the development of the actions which comprise the basic competences increases to a greater extent than that of those in the control groups when we compare pre and post-test results.

Significant differences between pre and post-tests

In order to continue the study we shall corroborate whether of not statistically significant differences really exist between the study groups at pre and post-test.

We first of all carried out Levene's Test in order to analyse the possible existence of a variance of difference between the groups comprising the experimental and control samples.. In the pre-test of the experimental groups $p = 0.034$ and $p = 0.875$ in the control group, which means that $p > 0.01$, in both cases. In the post-test of the experimental groups $p = 0.939$ and $p = 0.120$ in the control groups, which also gives $p > 0.01$. This means that there are no significant differences in the homogeneity of variance. This means that both the control groups and experimental groups can be considered to be homogeneous.

This was followed by a Student's T-test carried out on two samples with a 1% significance value. The total index of the questionnaire (descriptive statistics in Table 2) was used as the test variable and the groups (experimental and control) and moment (pre and post-test) as the unifying factor. Table 3 shows a summary of the results obtained.

Table 2.-Descriptive statistics of the total index of the questionnaire

		Group					
		Experimental groups			Control groups		
		N	Mean	Stand. Dev.	N	Mean	Stand. Dev.
Moment	Pretest	219	167,35	18,80	193	163,07	20,71
	Postest	168	174,00	17,94	160	162,44	18,79

If we consider the *unifying factor by groups (experimental and control)* it can be observed that there are no significant differences between the groups in the pre-test, as the significance value p= 0.028 is greater than α = 0.01. However, in the post-test the significance value became p = 0.000, i.e. less than α = 0.01, which means that it is possible to confirm the existence of significant differences between the experimental and control groups.

As regards the *unifying factor by moment (pre and post-test)*, and as the descriptive analysis seems to indicate, there are significant differences between the pre and post-tests results obtained from the experimental groups (p = 0.000). In the case of the control groups no differences have been appreciated in the pre and post-test, with a significance value p = 0.768 and therefore greater than α = 0.01

Table 3. -Summary of T-test results

	t	df	Sign. (2-tailed)	Mean differences	Standard diff. error	Difference confidence interval 99%	
						Lower	Higher
Pre-test Unif. factor: Groups (Experimental and control) Test variable: Total index	2.199	410	.028	4.28144	1.94660	-.75613	9.31901
Post-test Unif. factor: Groups (Experimental and control) Test variable: Total index	5.700	326	.000	11.56060	2.02804	6.30595	16.81524
Experimental Group Unif. factor: Moment (pre and post-test) Test variable: Total index	-3.518	385	.000	-6.65128	1.89038	-11.54483	-1.75773
Control Group Unif. factor: Moment (pre and post-test) Test variable: Total index	.296	351	.768	.62788	2.12358	-4.87201	6.12776

Cross-sectional study of the students

We shall now concentrate on comparing the level of competence perceived by the 272 identified participants who completed the pre and post-tests. For this calculation we found the level of each competence based on a scale of 4 categories: little improvement (level 1), some improvement (level 2), quite an improvement (level 3) a great improvement (level 4). The level is obtained by means of the following operation: The mean perception of the actions associated with each competence (on a scale of 1 to 6), is calculated by weighting the 4 (multiplying by 2/3) and rounding them off.

Once the pre and post-test levels of each competence have been found, they were compared to see whether they had increased or decreased. Subsequently, a summation of the variation of the levels was carried out and, if this was positive, we considered that the overall level had improved, if negative that it had decreased and, if the summation was zero, we considered that the same level was maintained.

As can be appreciated in Table 4. 58.16% of the identified participants in the experimental groups improve their overall perception of their level of competence, while, in the control groups, the percentage only reaches 39.86%.

Table 4.-Participants, who improve, reduce and maintain their pre-post-test competence levels.

Follow-up of identified participants in pre and post-test								
	Increase their level		Reduce their level		Same level		TOTAL	
	n	%	n	%	n	%	n	%
Experimental groups	75	58.14	39	30.23	15	11.63	129	100
Control groups	57	39.86	60	41.96	26	18.18	143	100
TOTAL	132	48.53	99	36.40	41	15.07	272	100

This shows that, during the research, that the perception of an improvement of the competence level was more generalised in the experimental groups, whereas in the control groups, there was a similar percentage of students who increased or decreased their level.

Study of basic competences

In order to complete the analysis, an in depth study was carried out of the results of personal basic competences as reflected in the COMPES self-report.

As can be seen in Table 5, in all cases, i.e. in both the pre and post-tests of the experimental and control groups, there is a repetition of the same least and best valued competences. This would seem to indicate the importance of work on the said skills before and during the research. In all cases, the best valued competences are the same and in the following order: teamwork, analysis of information, communication and application of knowledge. The competences with the lowest values in the four measurements are: creativity, assessment, independent learning and ethical sense.

Table 5.-Comparison of means and significance of the differences between pre and post-test competences of experimental and control groups

Competence	Experimental groups				Control groups			
	Pre-test Mean	Post-test mean	Diff.	Sign. (2-tailed)	Pre-test Mean	Post-test mean	Diff.	Sign. (2-tailed)
1. Application of knowledge	4.56	4.72	+0.16	.011	4.44	4.47	+0.03	.736
2. Appraisal	4.52	4.68	+0.16	.018	4.40	4.37	-0,03	.702
3. Problem solving	4.35	4.62	+0.27	.000	4.38	4.34	-0,04	.595
4. Analysis of information	4.71	4.81	+0.10	.109	4.56	4.56	0	.926
5. Communication	4.64	4.80	+0.16	.023	4.44	4.43	-0.01	.845
6. Independent learning	4.29	4.54	+0.25	.000	4.27	4.28	+0.01	.897
7. Ethical sense	4.55	4.57	+0.02	.814	4.15	4.12	-0.03	.807
8. Creativity	4.27	4.62	+0.35	.000	4.20	4.21	+0.01	.860
9. Teamwork	5.22	5.23	+0.01	.790	5,08	5,02	-0.06	.483
10. Assessment	4.25	4.57	+0.32	.000	4.29	4.24	-0,05	.536

If we concentrate on the differences between pre and post-tests, it can be appreciated that all 10 of the basic competences improve in the experimental groups while, in the control groups, there is only a very moderate improvement in 3 of them.

The competences with a significant improvement in the experimental groups from pre to post-test ($\alpha = 0.01$) are (Table 5): creativity (+0.35; $p = 0.000$), assessment (+0.32; $p = 0.000$), problem solving (+0.32; $p = 0.000$) and independent learning (+0.25; $p = 0.000$), which, in fact, are probably the four competences most related to the perspective and putting into practice of learning oriented e-Assessment.

Discussion

In order to verify the impact of e-LOA on university students' perception of their level of competence a quasi-experimental research, following a pre and post-test design with experimental and control groups, has been carried out. Our initial hypothesis was that the putting into practice of e-LOA actions would promote a greater development of university students' competences than traditional educational methods.

The "self-report of the development of university students' basic competences" (COMPES) was designed to collect the information necessary to confirm the hypothesis. This questionnaire shows the rating of the competence as perceived by the students and, apart from collecting data, is, in itself an opportunity for critical reflection and the putting into practice of metacognitive skills. COMPES comprises 37 items which reflect the actions associated with the 10 basic competences being studied. Between the pre and post-test experimental and control groups a total of 740 questionnaires were completed.

After analysing the results obtained it has been possible, first of all, to demonstrate that means of practically all the actions rated from pre to post-test improved in the experimental groups (34 out of 37), while the majority decrease in the control groups (22 out of 37). The actions which improve the most in the experimental groups are: "I adapt my education by analysing previous learning experiences" (+0.45), "when facing academic and/or professional situations I respond in an original and innovative manner (+0.54) and "I supply positive input for assessment designs and procedures (+0.64).

It has also been shown that there were significant differences between the pre and post-tests of the experimental groups, while, in the control groups, no statistically significant divergences were found. Moreover, in the pre-test no differences were found between the experimental and control groups while, in the post-test, there is a significant improvement in the groups in which e-LOA was used.

With respect to the cross-sectional study of the 272 identified students, the majority of the participants (58.16%) in the experimental groups improved their level of competence while, in the control groups, this only occurs in 39.86% of the subjects. It has also been possible to corroborate the findings obtained in previous studies, as well as confirming in practice the pillars of e-LOA by means of the analysis and follow-up of the competences which present a greater difference between the post and pre-tests of the experimental groups. In consistence with theoretical proposals, the competences which have significantly improved after the introduction of e-LOA actions in the university area are: independent learning (+0.25) (Boud, 1991; Stefani, 1994), problem solving (+0.27) (Gibbs, 1981), capacity for assessment (+0.32) (Sivan, 2000; Segers and Dochy, 2001) and creativity (+0.35) (Borootchi and Keshavaraz, 2002).

It has also been possible to relate the carrying out of realistic and creative tasks, participation in student evaluation and the input of feed-forward to improve self-regulated learning process capacities, judgments and problem solving, all of which are abilities which may benefit the professional future of university students.

All of the evidence obtained makes it possible to confirm the initial hypothesis and to assert the, given the statistical data and contrasts of the study, the university students included in learning oriented e-Assessment show a significantly higher development of their competences compared to those who followed a more traditional educational methodology.

However, certain limitations of the research cannot be ignored. The greatest difficulties probably involve the study groups. First of all because of the different peculiarities that might exist within each group and branch of study. Secondly, because it should be taken into account that neither were the control groups

completely foreign to the use of ITC or certain specific aspects of e-LOA nor were the experimental groups immersed to the same degree, in such an innovative methodology as that proposed, in all subjects. This is common bias in a lot research carried out in the field of education in particular and social sciences in general. This research was, however, a viable and effective option to bring us closer to the study objective.

Another limitation could refer to the validity of the measurements of basic competences in themselves, since the completion of the COMPES Self-report does not require that the competences be put into practice, as it based on how the competence is perceived, which means that we consider it to be an indirect measurement. However, different studies have show that students are capable of judging their own level of competence with certain guarantees (Baartman and Ruijs, 2011; Van Dinther, Dochy and Segers, 2011). In the same way, the completion of the self-report becomes, in itself, an activity of reflection where metacognition, self-esteem and self-concept come into play (Sundström, 2006). It has, moreover, been possible to design a simple self-report, transferable to other contexts, and which only takes a short time to complete. These are characteristics which are difficult to achieve when collecting information based on an external assessment of the basic competences identified.

The objective of this study is to pave the way for another more ample one which will involve nine Spanish universities in the context of the Re-Evalúa Project and whose aim is to confirm the findings shown here using similar materials and methods.

Finally, it is considered necessary to continue the research in different fields and from different perspectives of e-LOA, going into more detail as regards each of its components. This will make it possible to complete the definition of a new educational methodology with solid theoretical and practical foundation which, as far as possible, will, guarantee the adaptation of university education to the legislative, social and professional demands of the world today.

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NOTES

[1]The COMPES questionnaire is available at: http://avanza.uca.es/evalfor/docs/Autoinforme_COMPES.pdf

[2] Excellence project *"Re-Evalúa: reengineering of e-Assessment, technologies and the development of competences in university students and teaching staff"* ref. P08-SEJ-03502, financed by the Andalusian Regional Government's Ministry of Innovation, Science and Business.

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