

Use of facial authentication in E-learning: a study of how it affects students in different Spanish-speaking areas

So far, the authentication of students in E-learning has been considered important in order to avoid fraud by pupils. There are diverse technologies which can be used to recognize students. Facial authentication (by means of biometrics) is one of them and allows user identities to be corroborated and certified focusing on their facial physiological characteristics. The demand of students wishing to achieve admission to E-learning programs is actually high. Subsequently, it is essential for this type of education to be as respectable and recognized as any other. For this purpose, it would be essential to check the students' identity while they do their homework (e.g. Questionnaires, Lessons, Glossaries, Forums, Task mailbox, Wikis and Blackboard) using the Learning Management Systems (LMSs) such as Moodle platform. The main objective of this study is the analysis of student impressions concerning the development and implementation of facial verification for E-learning within the Moodle platform in different Spanish speaking areas like Spain and Latin American. In addition, a survey was carried out among the students after using the facial authentication tool within Moodle, so this study also gathers the student perceptions when they are facial authenticated while completing E-learning activities. The survey of 65 students from Masters produced high satisfaction scores about the acceptance of facial authentication as an improvement technique for distance education in the different countries studied. Nevertheless, in general Spanish students reached lower average levels compared to Latin American students. These differences are statistically analyzed to show their significance.

Keywords: Face recognition, online learning, analysis of perceptions, educational results, biometric recognition, Moodle.

1. INTRODUCTION

Over recent decades, the teaching system has varied significantly. Owing to the use of new technologies, a model focused on the teacher has given way to a new one led by the students. This kind is led by the pupils by means of the use of new technology tools and distance learning portals, frequently known as *virtual classrooms*, because they emerge with the idea that knowledge should be built in students' minds, instead of being

transmitted using books or encyclopedias without any alteration in the program.

Bliuc, Ellis, Goodyear et al. (2009) assert that universities are mutating a classic teaching model into a new blended teaching model, in which distance learning and face-to-face learning are combined. Distance learning is commonly known as distance education and E-learning as well. Toth, Pentelenyi and Toth (2008) affirm that E-learning is a new variety of interactive learning in which the learning content is available through the network and, as a result, provides an automatic feedback about teaching activities for the pupils. Rosenberg (2001) establishes that E-learning can be disclosed as the instructed or monitored ways of studying without the direct teacher's presence in class, but benefited from the tutors' planning and direction through a mean of communication that allows the interrelation between students and professors.

Specifically, distance education courses are increasingly prevalent in our society, and at the same time their demand has been increasing by all types of students from different countries. One of the problems that can compromise the quality of training online is the impossibility of demonstrating that the enrolled students are who they claim to be when they perform their academic tasks in E-learning platforms. In order to acquire a credible value for the online courses and subjects, they need the student authentication and Smowl satisfies this requirement.

HarryOver recent decades (1999) states that distance education has been adopted in almost all Latin American countries. It has achieved the largest coverage of students in Colombia, Mexico, Argentina, Brazil and Venezuela. Furthermore, thanks to the Ministry of Education, Culture and Sports of Spain, the official data of the Spanish University System (Course 2013/2014) is shown and it reveals that distance education has over two hundred thousand students online. The numbers of online students in different Spanish-speaking areas can be seen in Figure 1.

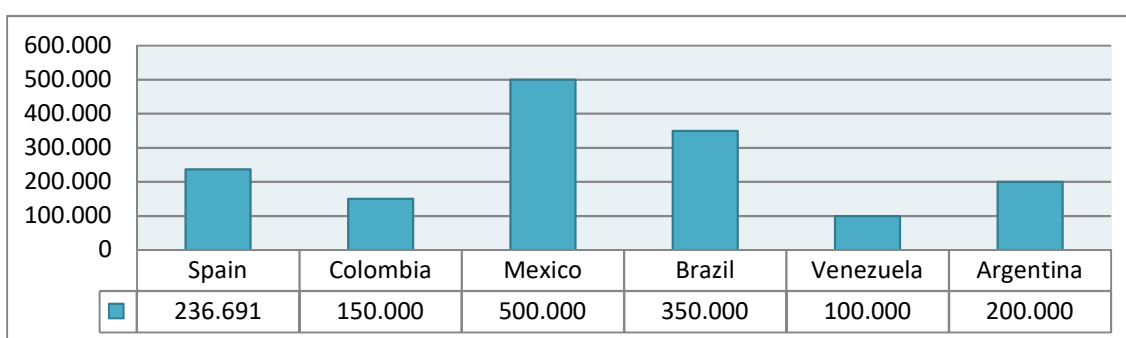


Figure 1 Number of online Students (Estimated)

Owing to the high enrolment rate that exists in these countries, it should be taken into account that in this kind of education an authentication system is really necessary in order to avoid fraud by students when they do their activities within the Moodle platform (Dougiamas & Taylor, 2003), and thus, avoid educational frauds. In this sense, Moodle has turned into one of the most used platforms in universities as an advantageous way to encourage interactions between professors and students (Celik, 2010).

It is important to delimit the definition of biometrics in order to implement this procedure of verification. Jain and Flynn (2008) establish that biometrics is a method for identifying people based upon physiological or behavioural characteristics. There are different typologies of biometrics, such as digital fingerprints, iris scan and voice recognition (García-Hernández & Paredes, 2005). However, it is thanks to facial authentication (Farshchi & Toosizadeh, 2011) where it appears the chance to verify in E-learning the absence of frauds while the students are doing their activities on the platform.

The first step in facial authentication is the acquisition of a real image. The system determines face alignment based on the nose's position, mouth's, and so on. After the alignment, orientation and dimension adjustment, the system generates a unique facial template (a series of numbers) so that it can be compared to the ones stored in the database. Ribaric, Fratric and Kis (2005) state that face-based authentication corresponds to a system that allows the identification and/or verification of a person's identity as of the unique morphological or behavioural characteristics of each human being.

On the other hand, the research has focused on the impression of Master students from different Spanish speaking countries about the implementation of facial authentication in the Open University of Madrid (UDIMA) within the Moodle platform. For the development of the study, a questionnaire was determined in order to know the perceptions of the students. Once these data were gathered, they were analyzed and compared, in order to obtain conclusions and results that can inform what students think about the incursion of facial verification in Moodle, considering the different Spanish-speaking areas.

Finally, the aim of this work comes out from the article of Guillén-Gámez & García-Magariño (2014). Then, the number of questions in this study questionnaire was enhanced, from 9 questions to 14 questions. Moreover, it has carried out a more precise individual analysis of each of the issues of the questionnaire. Furthermore, the results are now statistically analyzed to show the significant differences in the current study.

The rest of this article is constituted as follows: the next section introduces the background investigation related to the present work, alluding to the improvements over the existing literature; section 3 presents the incentive of the research; section 4 describes the sample of students, and determines the questions of the surveys; section 5 presents the analysis of the results of the surveys, extracting the most important facts that need to be taken into account before actually deploying this proposal in an online university; subsequently, section 6 mentions the conclusions and future work.

2. RELATED WORKS

This section presents a review of the scientific literature about facial recognition for their application in education. In order to make the reading easier the section has been divided into several paragraphs related to different issues of this main topic.

All human beings have unique morphological features that distinguish us from others. Face shape, geometry of parts of our body like the hands, our eyes and perhaps, the most well-known, the digital fingerprint, are some characteristics that differentiate us from the rest of human beings. Biometrics is a method of people authentication based on their physiological and behavioural features. It is a process similar to the one a human being usually does when he/she recognizes or identifies people for their physical appearance, their voice, their way of walking, and so on.

Tapiador & Sigüenza (2004) indicate that the first practical uses of biometrics were in China more than 1,000 years ago, where potters started to include their fingerprints in the products they created in order to mark them, as a signature symbol. Since then, many authors have investigated profoundly in the field of biometrics and facial authentication, being detecting plenty of methods with a big diversity of uses, one of them, for the authentication of e-learning's students.

For instance, the authors Kawaguchi, Shoji, Weijane et al. (2005) have carried through a method to control the class attendance by the students through face authentication. They suggest a method for the estimation of the attendance using all the face authentication results obtained thanks to continuous observation. In this work, the system is composed of two kinds of cameras, one of them is the detection camera which is placed in the classroom's ceiling in order to obtain the seats where the students are seated. The other camera is opposite the students' seats to take images of their faces. The experiment was carried through with a sample of 19 students, who were placed in the centre of the classroom. The experiments implemented with the students showed a result of higher performance through continuous observation. The main difference between this work and the current one is that the latter is based on knowing the perceptions of students while the university is using facial recognition software in order to monitor them. In addition, the current work only uses the webcams of the laptops of the students.

Other authors who have excelled, thanks to their research in this field, were González-Agulla, Alba-Castro, Argones-Rúa et. al (2008) who achieved a favourable positive result in their study about the application of facial verification in Spanish education. The objective they pursued was to assure that the students in line are who they say they are, and to know accurately the amount of time that they spend in front of the computer reading or doing their virtual activities. Sixteen students of the Higher Technical School of Telecommunications Engineering of the University of Vigo (Spain) did a test using facial authentication. The test had three parts: (1) the students reply survey; (2) the student moves to the next computer to the right in order to take the role of impostor and do the second survey; (3) the student checks the obtained results in the two questionnaires. There are similarities between this investigation and the current one, because of the use of software of facial authentication for the users' identification. Nevertheless, the main difference is that the current work verifies the identity of the students all the time their academic activities last within the Moodle platform. That is to say, the students' identity is verified from the beginning of the online session till the end,

not just at the onset.

On the other hand, the replacement of face-to-face final exams with online exams is quite interesting for distance universities, although the main concern for them is the authentication and supervision of the students, due to the absence of face-to-face supervision, and the possibility for the students to use other people to improve their marks. In this quandary, Ullah, Xiao & Lilley (2012) suggest a mechanism of facial authentication in order to guarantee that the students are not replaced to improve their marks in online tests. It is recommended to use a profile-based authentication framework (PBAF) together with a user's identification and the password for the students' authentication during distance exams. There are similarities between both works, considering that one of the objectives of our investigation is to know the students' opinions about the replacement of face-to-face final exams for online exams, incorporating facial authentication for the verification and monitoring of themselves.

Some works should be pointed out regarding those lines of investigation related to Moodle and the different kinds of tools and plugins that can be used in that platform in order to carry through the student's evaluation.

Hirschel (2012) presents a sociocultural approach about the students' perspective in foreign language (English), specifically the use of three applications of Moodle: forums, glossaries and tests. This investigation used a questionnaire for the information extraction of the sample of participants. The participants were 23 first-year college students in their second semester in a university of foreign languages in Japan. The results showed that students were mostly grateful for the exercises in the forums for strengthen their learning.

In a similar way, Knutzen & Kennedy (2008) examine how social engagement in an online learning environment (OLE) can transform teachers' perceptions of their own pedagogical practices. The data were gathered during a 10-month period, with a group of five teachers in an international school of Hong Kong while they were learning how to use Moodle in order to create combined learning environments. The results show that teachers with more experience in teaching can be more confident using OLE in a constructivist way.

On the one hand, Kakasevski, Mihajlov, Arsenovski et al. (2008) present an analysis of students' understanding about diverse modules of the Moodle platform. Eighty four students participated in the study, completing a questionnaire after using Moodle. The objective of this questionnaire was to collect preliminary opinions of the system, and concerns on the user interface.

If these works are compared with the current one, the main difference is that the current research analyzes the perceptions of students from different Hispanic speaking countries on the implementation of face authentication in their online activities, experiencing this situation through a determinate facial recognition software called

Smowl (Smowl, 2014), which is described in the next section.

3. FACIAL AUTHENTICATION IN MOODLE

The objective of this study is to know the degree of valuation and usability from the implementation of facial authentication in E-learning through the Moodle platform in different Spanish speaking areas like Spain and Latin American countries. In other words, the main objective is to know the student ratings on how a facial authentication software works (Smowl) in the E-learning within the Moodle platform, as a technique for improving quality in distance education, avoiding possible frauds in evaluation activities of students. For this reason, UDIMA bets on investigating the possibilities offered by Smowl at the time of verifying the identity of students when they perform their academic activities in Moodle virtual classrooms.

Smowl emerges in order to give a solution to this continuous need for online student authentication. Using a suitable method, the verification of the student's identity is achieved not only at the time of login, but also during the whole time of the online session. Smowl starts just after students log on without any other inconvenience for them. During all the time that the face authentication system can monitor the user, all biometric information captured is stored in the user history.

The authentication and monitoring are made by recognizing facial characteristics of users. The course will work in the same way; the only difference is that Smowl will randomly capture photographs of students through the webcam of their computers while they are working in the virtual classrooms of the UDIMA. Furthermore, instructors may choose the frequency they want to monitor students with.

The results will lead to a report which will be continuously updated with information about each student where the university will have access so as to track student authentication. Moreover, neither the university nor the company that created Smowl will have access to personal information of the student, since images will be exclusively assigned a bar code awarded by the university for each student. That is to say, Smowl will make available to the university not pictures of the students, but rather the report that give rise. In Figures 2 and 3, one can see the control panel of Smowl, in which the teacher has access to observe the tracking of students.

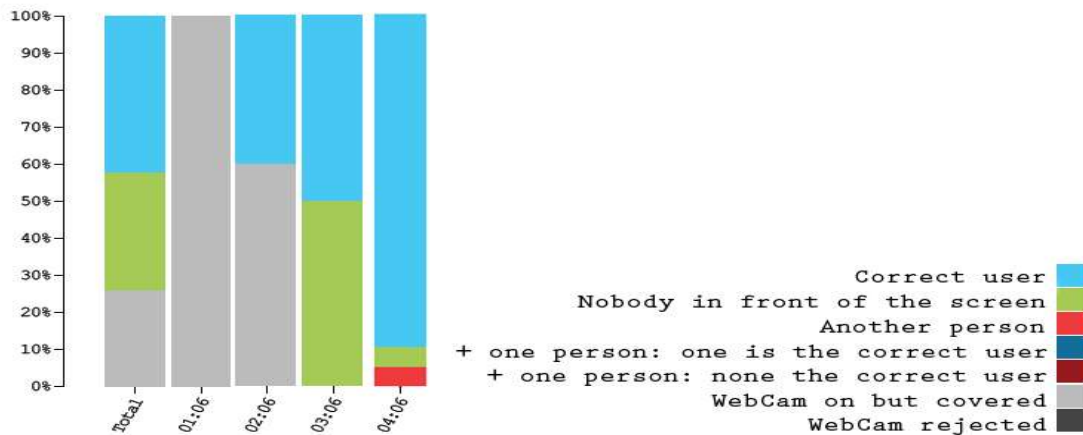


Figure 2 Values of student results for periods of time.

Through Figure 2, one can see the percentage of reliability of each student in each time period in which student was monitored by Smowl. Regarding to Figure 3, one can observe the percentages of each of the options Small offers in greater detail. For instance, this figure shows how out of the 20 images that the software took from student, the 68,67% of them were the correct user. Regarding the pictures that do not pass the test, the tool classifies the different scenarios such as (1) the user declined the permission to activate the webcam, (2) the webcam was covered or does not work properly, (3) there were several people and none of them is the correct user, (4) there is more than one person and one of them is the correct user, (5) the person of the picture is not the user who claims to be, and (6) there is nobody in front of the screen.

T_M05_2013	WebCam rejected		WebCam on but covered		+ one person: none the correct user		+ one person: one is the correct user		Another person		Nobody in front of the screen		Correct user	
Total	0	0%	0	0%	0	0%	0	0%	2	6.67%	8	26.67%	20	66.67%
1	0	0%	0	0%	0	0%	0	0%	2	6.9%	7	24.14%	20	68.97%
2	0	0%	0	0%	0	0%	0	0%	0	0%	1	100%	0	0%

Figure 3 Control Panel Smowl

4. FEATURES OF THE PARTICIPANTS AND THE SURVEY.

The research was carried out with 65 students from UDIMA in the academic course 2013-2014. Figure 4 presents these data graphically.

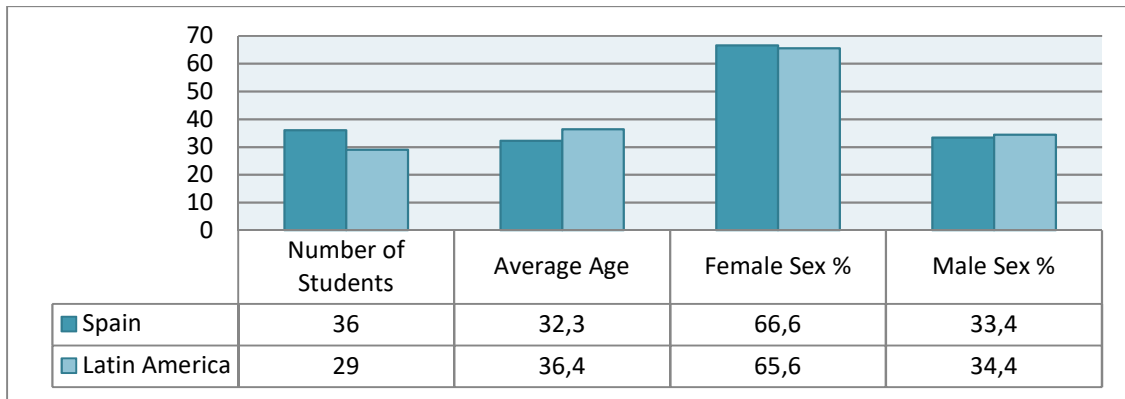


Figure 4 Details of the participants

The questionnaire was composed of 14 questions related to the acceptance and use of facial recognition tools in Moodle by students. Table 1 presents these questions, which were answered by a seven-point Likert scale with the following response options and their corresponding numerical values: Totally disagree (1), Disagree (2), Slightly Disagree (3), Neither agree nor disagree (4), Slightly Agree (5), Agree (6) and Strongly Agree (7).

Table 1 Questions of the questionnaire

1	Do you think it is appropriate to use facial authentication in E-learning?
2	Do you think this method should be introduced in face-to-face universities with activities through virtual learning environment (e.g. Moodle)?
3	Do you think this method should be applied aside from Moodle platform, for example in online courses?
4	Would you like to see this technology advancing in order to replace current classroom exams for online exams with a sure facial recognition?
5	Do you think it is fair to monitor distance education in order to avoid cheating?
6	Do you think it is fair the use of this software to distinguish between responsible students that do their homework and the dishonest ones that ask other people to do the activities for them?
7	Do you think you have remained more focused realizing the different activities knowing you could not talk to other people?
8	Do you think this authentication method will improve the academic work of some students because they feel forced to do their activities by themselves?
9	Do you think you would have been more relaxed doing your duties without the user's computer observation?
10	Do you think you have dedicated the same time for the realization of the activities when you knew your identity was being verified?
11	Do you feel confident about yourself knowing that you cannot ask others for help in order to perform your own activities?

12	If you could choose, would you rather do the activities with the incorporation of this software in order to demonstrate that you have done the activity, and not be harmed in front of students that ask others to do their activities?
13	Do you think it is appropriate that teachers choose which activities have to be done with facial authentication?
14	Finally, as global assessment, do you think it is appropriate that UDIMA invests effort in the technological innovation that the inclusion of facial authentication means in virtual learning environments as Moodle?

5. RESULTS OF THE ANALYSIS

In order to carry through the analysis of the data obtained, a statistical analysis should be realized. In this analysis, there are a number of points to take into account as the sample size of the participants, the sampling distribution, the validity of the assumptions and the relationship between dependence/independence.

Due to the sample size, the independence between both groups and the way they are distributed, the most appropriate contrast to carry out the statistical inference is the Mann-Whitney nonparametric test. Besides, a box plot diagram is extracted to know the main measures of location, measures of dispersion, and atypical observations of a frequency distribution. Moreover, it is a research design with quasi-experimental non-equivalent groups.

On the other hand, in order to attain the statistical analysis, the SPSS software has been used to organize and analyze the data in an exhaustive way. It is necessary to determine the variables and groups that have been used for the investigation: the groups of students from Spain (SPA) and from Latin America (LAT), where both of them have answered ordinal variables (Questionnaire queries) which take values between one and seven referring to the Likert scale degrees.

Table 2 represents the queries of our questionnaire for both groups of students, with the means and the medians of each group of students, as well as the level of significance which can be deduced from the Mann-Whitney test with its corresponding decision. Moreover, it should be known that for the representation of the column of “differences among the means” in every case it is used the difference between LAT and SPA groups.

	SPA		LAT		Difference between the means	Mann-Whitney U Test (Sig.)	Decision
	Mean	Median	Mean	Median			
Q1	5,86	6,00	6,66	7,00	0,80	,000	Reject the null hypothesis
Q2	5,50	6,00	6,28	6,00	0,78	,003	Reject the null hypothesis
Q3	5,06	5,00	6,17	6,00	1,11	,001	Reject the null hypothesis
Q4	5,83	6,00	6,55	7,00	0,72	,012	Reject the null hypothesis
Q5	5,56	6,00	6,24	7,00	0,68	,026	Reject the null hypothesis
Q6	5,53	6,00	6,34	7,00	0,81	,004	Reject the null hypothesis
Q7	3,61	4,00	5,17	6,00	1,56	,001	Reject the null hypothesis
Q8	4,97	6,00	5,86	6,00	0,89	,028	Reject the null hypothesis
Q9	4,19	5,00	4,10	5,00	-0,09	,968	Retain the null hypothesis
Q10	5,67	6,00	5,14	6,00	-0,53	,618	Retain the null hypothesis
Q11	5,69	6,00	6,62	7,00	0,93	,013	Reject the null hypothesis
Q12	4,86	5,00	6,17	7,00	1,31	,000	Reject the null hypothesis
Q13	5,39	6,00	6,31	7,00	0,92	,004	Reject the null hypothesis
Q14	5,81	6,00	6,31	7,00	0,50	,064	Retain the null hypothesis

Table 2 Statistical details of each question

From a general analysis of the table 2, it could be observed that just the questions nine, ten and fourteen are the only ones which do not present a significant difference of their means regarding the Mann-Whitney test, deducting that both groups give some values very similar for these questions, without significant differences between both groups of students. In relation to the results obtained in the column “differences among the means”, there are some negative values, because the LAT group gives a lower average of valuation in the Likert scale regarding the SPA student group. Next, a more exhaustive analysis with the “Box-plot” diagrams will be carried through for each query of the questionnaire

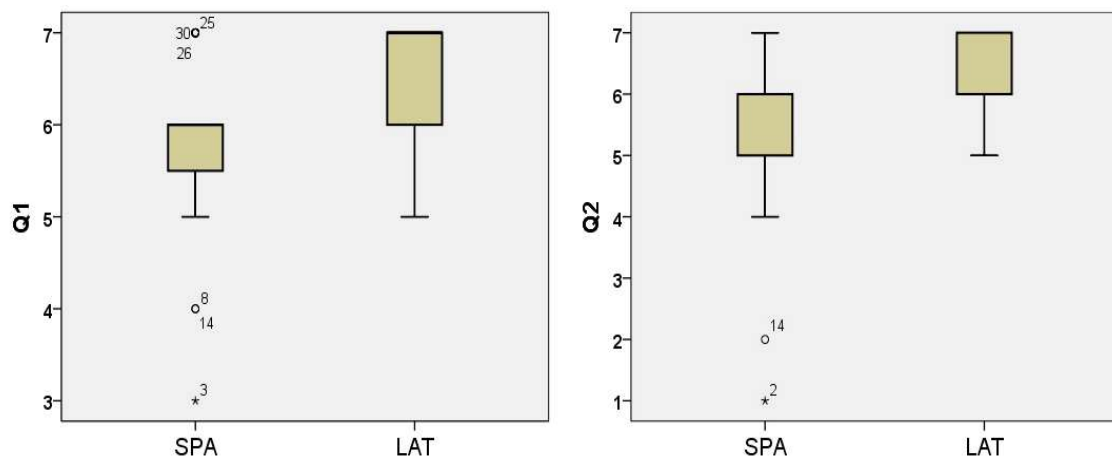


Figure 5 Q1: Do you think it is appropriate to use facial authentication in E-learning? Q2: Do you think this method should be introduced in face-to-face universities with activities through virtual learning environment (e.g. Moodle)?

Figure 5 shows those questions related to the appropriateness of the implementation of facial authentication for the realization of the students' activities in distance education and in face-to-face universities that use virtual learning environment (like Moodle) as well.

On one hand, question 1 demonstrates that both groups of students have high values regarding the Likert scale, deducing that the use of a software system like this is quite appropriate in a kind of teaching that really requires it in order to have more validity for the society,. Having said that, if both groups are compared and contrasted, it can be seen that the group of students from Latin America gives a higher valuation than the group from Spain with a median of 7, which is the maximum value in Likert scale. In addition, it can be observed how there are just some atypical values in the group of Spanish students.

On the other hand, in question 2, it can be seen that once again both groups have very high values in the Likert scale, which are very close to degree 7, the maximum. Therefore, both groups think it is correct to use it in face-to-face education as well. If both groups are compared and contrasted, both of them have the same mean, because the main difference is that the means of the groups of students from Latin America (6.28) is higher than the one from the Spanish students (5.50).

Keeping in mind these two questions, it can be thought that almost all the students from both territories think that a software system of this kind is necessary as a technique for improving the quality of distance education, avoiding possible frauds in the evaluative activity of the students.

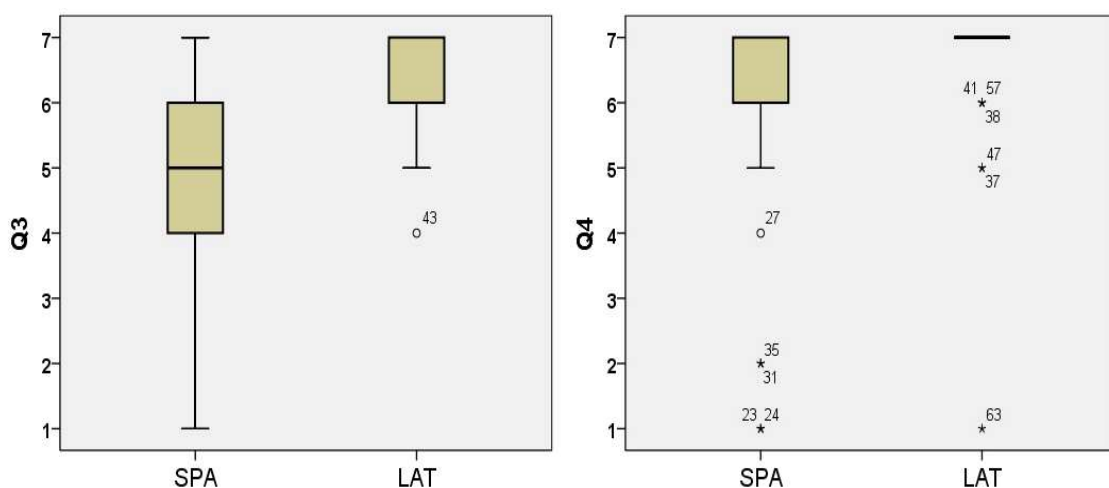


Figure 6 Q3: Do you think this method should be applied aside from Moodle platform, for example in online courses? **Q4:** Would you like to see this technology advancing in order to replace current classroom exams for online exams with a sure facial recognition?

In particular, figure 6 shows those questions about the implementation of tools of facial authentication in virtual learning environments. This might be favourable,

especially in distance education, the realization of online courses because nowadays, there are many universities that offer online courses to recognize subjects or parts of them; or final test that do not imply the compulsory journey of the student, because till now none of those learning systems has been completely online; they have always incorporate the fulfilment of a final face-to-face exam that allowed to verify the identity of the students in order to assess the knowledge acquired during their studies.

On one hand, in question 3 it can be seen how Latin-American students think it is better to use Smowl in online courses than Spanish students. If the medians from both groups are taken into account, it can be observed how Latin-Americans students have a median of 6 with respect to the median of 5 from the group of Spanish. However, if both data are kept in mind, both groups think it is appropriate to apply tools of facial authentication in online courses, with degrees very closed to the maximum in Likert scale (Degree 7).

On the other hand, in question 4 the values from Latin-American students are higher than the ones from Spanish students. The median of this group keeps being in 7 that is the maximum if it is compared to the Spanish group that is in 6. Besides, in both groups there are atypical values, which do not harm the high medians both groups have in Likert scale.

Therefore, both students groups agree that the application of this kind of software during the realization of a final online exam would achieve that all the process to be from a distance, without any mandatory journey to a physical central office of the university or face-to-face identity verification. For all of these, the facial authentication software is key for the degrees of distance institutions to achieve the same value that those offered by face-to-face institutions.

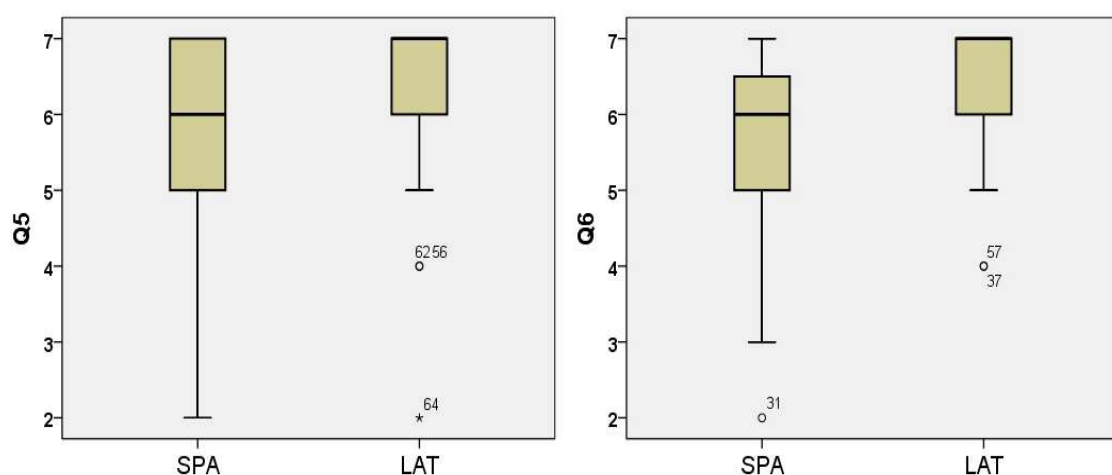


Figure 7 Q5: Do you think it is fair to monitor distance education in order to avoid cheating? **Q6:** Do you think it is fair the use of this software to distinguish between responsible students that do their homework and the dishonest ones that ask other people to do the activities for them?

There is a series of key questions in our investigation, and they are about the

opinions of the students about the fairness of verifying the identity of the students during the time they are doing their virtual tasks in order to avoid fraud from the students who cheat.

As question 5 shows, both groups of students have high values, so it is understandable that both groups think it is fair to control it in order to avoid frauds. But if both groups are analyzed and compared, the group of students from Latin America has higher marks than the group from Spain, with a median of 7, where there are just three atypical values for this group; in exchange, for the group of Spanish the median is 6, with opinions of the students in all the degrees of the Likert scale. So, Latin American students consider this method is more important to be carried through.

Something similar happens in question 6, because the group of students from Latin America has a higher median and just some atypical values if they are compared to the Spanish student group who have a lower median (median of 6) and with values from degree 3 to 7 in Likert scale. Therefore, Latin American students think it is fair to verify the identity of the students in order to distinguish between those who cheat.

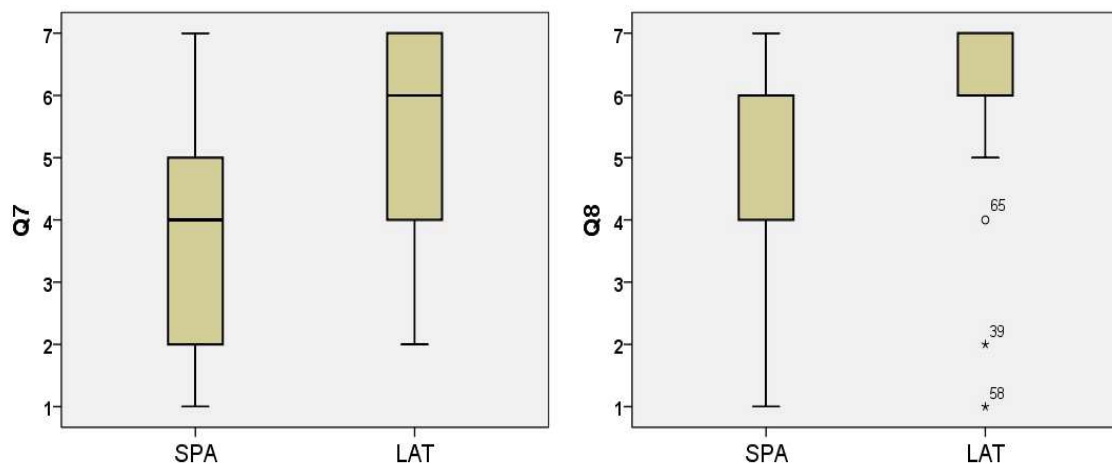


Figure 8 Q7: Do you think you have remained more focused realizing the different activities knowing you could not talk to other people? **Q8:** Do you think this authentication method will improve the academic work of some students because they feel forced to do their activities by themselves?

The following group of questions is focused on knowing the opinions the students have about Smowl, specifically after using the software, they were asked if they have been more attentive to the realization of their tasks, because they could not be talking to others or doing the activities with another students, considering that Smowl took pictures of the user each couple of seconds and verified if there were more than one person behind the webcam. In addition, if the students keep more attentive in the realization of their tasks, it is possible that their efficiency improves.

Question 7 shows how once again the group of students from Latin America has higher values than the other group, having a median of 6 in relation to the median of 4 from the Spanish students. So, Latin American students think that this software has helped

them to be more attentive when doing their activities in Moodle. Next, it would be possible to compare if the student have improve their efficiency for having been more attentive.

Question 8 confirms the conclusions deduced in the previous paragraph. The students from Latin America think that thanks to the fact of being more attentive, their marks have improved. Almost all the opinions of Latin American students are in the first and second quartiles with a rank from 6 to 7 in Likert scale. Even the Spanish students think that the use of this software might help them to improve their academic record, even existing values in all the degrees of the Likert scale, what does not happen in the group of the students from Latin America.

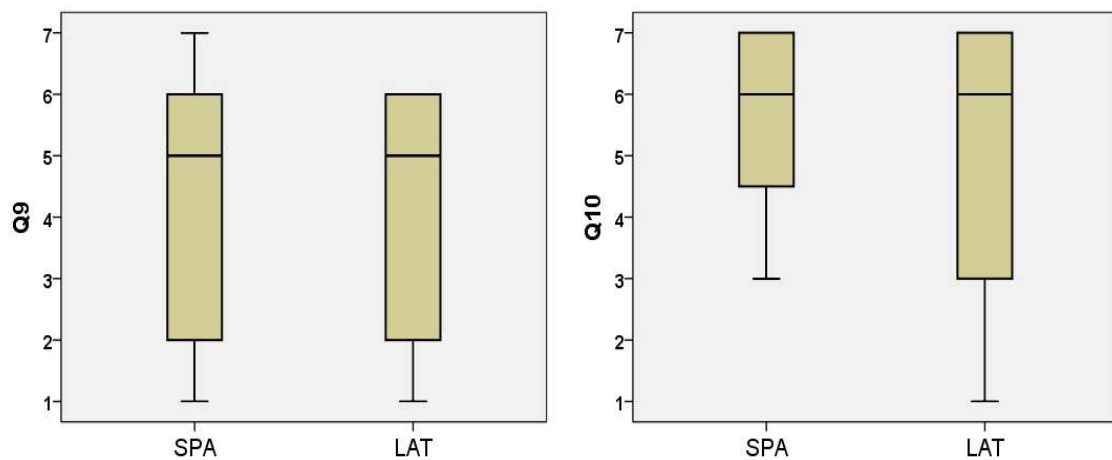


Figure 9 Q9: Do you think you would have been more relaxed doing your duties without the user's computer observation? **Q10:** Do you think you have dedicated the same time for the realization of the activities when you knew your identity was being verified?

Figure 9 contains those questions that conserve the null hypothesis of the investigation; therefore, both groups of students have similar values for both questions, which will be shortly analyzed later, because both groups think the same.

It can be seen in question 9 that both groups have a median of 5 when they are asked if they think they would have been more relaxed without having to use a facial authentication tool in their activities. Therefore, both groups see Smowl as a negative point because they feel disturbed and cannot do their activities comfortably. Maybe, if the students had used the software more time, their opinions would have changed, so as future work, the time of use of Smowl by students will be increased in future analyses.

For both groups of students, the fact of having to use a software system of facial authentication as Smowl has not caused a decrease or increase of the time spent in the realization of their activities in Moodle platform. Both groups have medians of 6, so they think they have dedicated to their activities the same time and the use of Smowl has not affected at all.

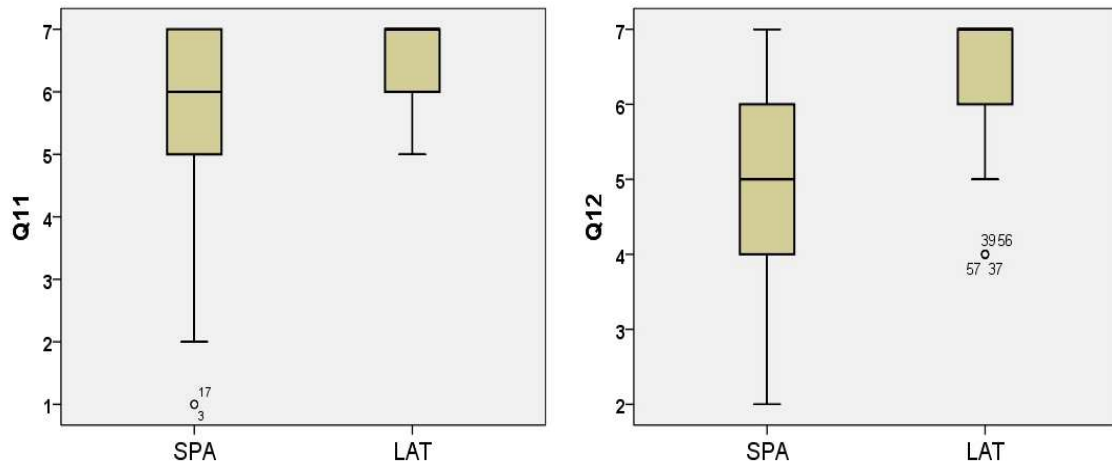


Figure 10 Q11: Do you feel confident about yourself knowing that you cannot ask others for help in order to perform your own activities? **Q12:** If you could choose, would you rather realize the activities with the incorporation of this software in order to demonstrate that you have done the activity, and not be harmed in front of students that ask others to do their activities?

Question 11 has very positive values in both groups of students with medians of 6 and 7 for the group of Spanish students and Latin Americans respectively. Just the Spanish group has some atypical values causing that their values are lower than Latin Americans'. Both groups are not afraid of having pictures taken when they do their activities despite the fact that they cannot ask for external help. That is to say, they feel confident and think that the fact of being "controlled" will not affect in their activities or their academic efficiency. Thus, it is proved again that both groups of students do not have any problem using facial authentication tool in distance education.

It should be pointed out that question 12 has valuable information, because it is important to know if the students would have liked to realize their academic tasks of Moodle platform without the facial authentication software Smowl, or they do not feel bothered for its use, and this would mean that they do not feel bothered when pictures of their personal life are taken in order to check who they are. Again, the group of Latin American students has higher values (median of 7) than the Spanish students (median of 5). There are just four atypical values in the group of students from Latin America, being the rest of the values of the students between the ranges 5 and 7 of Likert scale. In exchange, for the group of Spanish the values are from degree 1 to 7 of the same scale.

Therefore, one of the main conclusions of this pair of questions, is that both groups feel confident when they do their activities with this kind of facial authentication software, the students from Latin America see more positively the use of the software than the other group with the intention of showing that they do their activities by themselves.

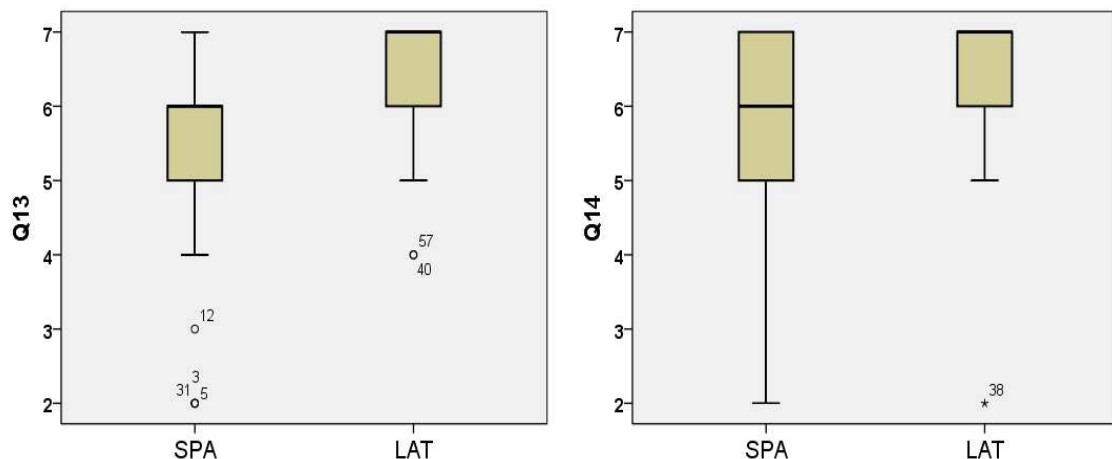


Figure 11 Q13: Do you think it is appropriate that teachers choose which activities have to be done with facial authentication? **Q14:** Finally, as global assessment, do you think it is appropriate that UDIMA invests effort in the technological innovation that the inclusion of facial authentication means in virtual learning environments as Moodle?

During all the investigation, the opinions the students have had about the use of Smowl have been crucial. In this way, because the students have become the key element of this process, it is considered opportune to know their opinions: on one hand, about the possibility for the teachers to choose in which kind of activity of virtual platforms, as Moodle, they want to use it; and on the other hand, about the efforts for the investment in technological innovation in order to improve the education given in the UDIMA.

Question 13 shows how the students from Latin America keep having higher values than the Spanish's' with a median of 7 and 6 respectively. However, both values are very positive in Likert scale, because the maximum value is 7. Thus, it is understood that both groups think that it is appropriate for the teachers to be able to choose in which kind of activity is more proper to implement a facial authentication software, because for example, marks from the tests are 3.33% of the global mark, while a continuous assessment activity is a 25% of the global mark.

Finally, in question 14, the students from Latin America offer a higher value (median of 7) than the Spanish group (median of 6) with respect to the Likert scale. Hence, both groups of students from UDIMA would appreciate an investment from their university and the implementation of a software as Smowl would benefit their quality and prestige, improving the process that are imparted in it and adding value to its degrees.

6. CONCLUSIONS AND FUTURE WORK

Distance education is becoming more popular in our society, since it is increasingly demanded by all types of students. Nonetheless, it presents an unresolved problem: the identification of the student who claims to be doing their online tasks and taking part in the distance learning. All these problems seriously affect the valuation and credibility of distance universities in relation to the quality that this type of degree offers.

Regarding to these issues, facial authentication software such as Smowl seems to

be the ideal solution to resolve the problem of the identity of students. In the present project, we investigated about the acceptance that could potentially have this kind of software in virtual learning environments, specifically in Moodle virtual classrooms, with students from different Spanish speaking countries.

The analysis of the replies of the students revealed that the respondents from Latin America valued the implementation of this tool in distance education more than Spanish students. Even though, in some questions of the questionnaire, the Spanish students group keeps a higher average in Likert scale than the one from the Latin American group.

Contrasting and analyzing the data gathered, it can be pointed out that countries from Latin American have higher acceptance of the tool, but at the same time there are more Spanish students signed up in distance courses than Latin Americans. One possible reason for this fact can be that Spanish students are more used to online education (for now without being monitored in LMSs), and consequently they feel facial verification as an intrusive technology that they have not used for many courses. On the other hand, Latin American students have started online education more recently, and they find more appropriate to authenticate the student identities, since they are not still very used to LMSs without biometric authentication.

The work of this survey opens new ways and lines of research, which can be considered in future work. In the first place, it is planned to develop a Moodle plugin with Smowl accessible for all the education society, in which teachers can configure the activities where they want students to be facially authenticated. Furthermore, the software should be improved little by little having in mind the indications that students suggested in the questionnaire.

The study is also planned to be continued with more elaborated and extensive questionnaires in order to know the opinions of the students in both Hispanic areas. Moreover, this research will also incorporate an analysis of the legislation issues about privacy in the different countries. In the future, it is also relevant to wonder until which point biometrics allows privacy. In fact, we plan to reflect on this aspect, because any technology based on biometrics is habitually considered to be able to dehumanize and threaten the privacy rights of the people.

Broadly speaking, Smowl is positioned as a key piece for the degrees offered by open universities in order to achieve the same value than those offered by face-to-face institutions. We may be witnessing the change on the vision we have of this kind of education, increasing the number of enrollments by the students and being able to certify that students have done their online tasks by themselves.

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