SEEQ Questionnaire for validating the teaching improvement when introducing Digital Storytelling in Higher Education

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Abstract — In higher education, improving learning strategies is a widely studied topic and also considered a matter of concern to the teaching community. For that reason, the teaching team in charge of the Information Security module unit has applied the SEEQ questionnaire since the 2012-13 academic year. SEEQ questionnaire has a long trajectory of use in order to analyse the effectiveness of teaching. In the present contribution, we analyse the effects of the introduction of Digital Storytelling in the ECTS activities during the last course session, obtaining results from the SEEQ questionnaire when comparing to the previous year data, in which Digital Storytelling was not considered

Keywords – Digital Storytelling; SEEQ Questionnaire; teaching changes.

Resumen — En educación superior, la mejora del aprendizaje es un tema ampliamente estudiado y que preocupa a la comunidad docente. Por este motivo, el equipo docente, de la asignatura Seguridad de la Información, aplica el cuestionario SEEQ desde el curso 2012-13. El cuestionario SEEQ tiene una amplia trayectoria de uso para analizar la eficacia de la docencia. En el presente trabajo se analizan los resultados obtenidos del cuestionario SEEQ y el efecto que tiene la inclusión de Digital Storytelling, en el desarrollo de la actividad ECTS, en el último año con respecto a los anteriores, en los que no se había aplicado.

Palabras Clave - Digital Storytelling; cuestionario SEEQ; cambios docentes.

I. INTRODUCTION

From the beginning of the implementation process of university degrees in Spain, at the end of the first decade of this century, up to now, there have been implemented many processes of improvement and measurements. They have been developed by institutions and teaching teams from different departments and universities and mainly based on the strategic plans that universities usually have.

This paper examines the results obtained from a quality verification system. This system has been implemented in the subject named Information Security, which explores students´ opinion on teaching and, more generally, on the subject itself.

As said before, the experience described below has been carried out in the Information Security module [1], which is taught jointly in the third year of the Bachelor Degree in Computer Science Engineering (GIITI) studies and in the fourth course of the Bachelor Degree in Computer Networking Engineering (GIT) studies in the University Center of Mérida of the University of Extremadura. Such module is structured in 4.5 theoretical credits, 1.5 practical credits and 0.3 follow-up activities, scheduled tutorials or ECTS tutorials (European Credit Transfer System). The latter correspond to 3 hours of study time per each work group. They will be discussed later.

The proportion of credits allocated to these ECTS tutorials is pretty low; however, it should be noted that this figure corresponds only to face-to-face tutoring sessions. In these sessions, the topic selection is carried out, then they are assigned to the different groups; also, monitoring activities are scheduled and clarification of doubts related to the experience development. However, as far as our experience is concerned, the face-to-face tutoring time has been invested in developing a group work scheme that contributes to the effective development of the work. Most of the group work and individual work is done in a non-presential way.

Briefly, we will refer to what specific competencies must be addressed during this module unit, which can be consulted for more details in [1]:

- Knowledge of telecommunication regulation at national, European and international levels. (GIT).
- Ability to apply techniques on which networks, services and telematic applications are based, such as management, signaling and switching systems, routing, security (cryptographic protocols, tunneling, firewalls, collection mechanisms, authentication and digital content protection mechanisms), traffic engineering (graph theory, queuing and teletraffic theory), pricing; reliability and quality of service, both in mobile, personal, local or large distance environments, with different bandwidths, including telephony and data . (GIT).

- Ability to understand, apply and manage the warranty services and insurance of computer systems. (GIITI).

On the other hand, the assigned transversal competences are not less important. Thus, this module must develop the following ones:

- Effective communication (in oral expression and comprehension), knowledge, procedures, results and ideas related to ICT, with special emphasis in writing technical documentation.
- Motivation for enhancing quality and continuous improvement, behaving with strictness, responsibility and professional ethics.

Due to the active concern for teaching that the teaching team of this module has always had [2], they have been carrying out the questionnaire SEEQ (Student's Evaluation of Educational Quality) [3] since the 2012-13 academic year, year by year until present day. Just the evolution of these results is what we show in this paper.

In addition, the University of Extremadura also carries out its own quality measurements and student satisfaction surveys every academic year, leaded by the Vice-chancellor for Teaching Quality. It is part of the ongoing strategic plan [4]. Student opinions about each teacher are collected and processed for the report that is provided to the College Board and University Managers. However, in spite of the fact that the university has already an official system as described before, this teaching team tries to have a summative and formative evaluation of the module unit [5], which allows to identify strengths and weaknesses of the teaching-learning process. This complementary assessment will enable us to reflect and take the necessary decisions to enhance the teaching programme, and thus we will be able to solve those detected deficiencies or insufficient aspects concerning the performed actions in the classroom.

II. OBJETIVE

The primary objective is to ensure that students become active subjects of the teaching-learning process in which they are part from the first day of attendance to the module classes. To this end, in the present course 2016-17 the use of Digital Storytelling [6] [7] has been introduced for the development of ECTS activities [8], with the aim that the students improve the acquisition process of transversal competences of the subject.

III. USING DIGITAL STORYTELLING

It is known that there are many definitions of Digital Storytelling. However, there is not much controversy about what it really means. In summary, Digital Storytelling can be defined as storytelling with support for multimedia elements (images, audio, music, text, etc.) and their actions (transitions, accelerations, etc.) [9]. Nowadays, the possibilities offered by the new technologies should make us think of a new language or rather new forms of expression and communication. This can be evidenced in the current boom of products related to multimedia expression and communication (animated Power Points, memes, videos, etc.). In fact, some author [10] defines it as a new genre, cited by [11].

This paper examines if this change in the teaching-learning process has been perceived as an enhancement by the students through the introduction use of Digital Storytelling, comparing to the perception of those students from previous courses, in which this technique was not used.

The use of this technique has been introduced as an initial test within the ECTS activities in the module named before. To this end, work groups of four has been made up of randomly selected students. All the groups have done the work on the same topic, specifically "Block cipher. As a final goal, they have shown the digital story that they have created in class among the rest of students.

Several methods have been used to assess the development and progress of students' knowledge and the associated competencies with this technique throughout the whole module period. The used methods have been the following ones: the Associated Networks Pathfinder [12]; data collection in open format (through writing down brief texts about the topic) in each face-to-face ECTS tutoring session; then, a qualitative analysis of these texts has been carried out using WebQDA software [13]; the SEEQ questionnaire itself, which is being detailed in this paper; and finally a satisfaction questionnaire on the use of Digital Storytelling as a teaching-learning technique. All these methods has been applied for validating of this pilot teaching project to the fullest possible extent.

IV. SEEQ QUESTIONNAIRE

Students´ opinions collected through surveys are becoming one of the most common ways of evaluating teaching in higher education. However, the use of the results extracted from these questionnaires, used as an instrument for continuous improvement of teaching in a specific module during a continued period, perhaps has not yet been implemented properly. In such a way, this assessment method allows for introducing small changes into a stable structure of class activities and then measuring their involved effects through the surveys and, therefore, reviewing the whole teaching-learning process.

To verify the results, an adaptation of the SEEQ questionnaire, created by Hernert Marsh in 1970 and updated in 1982, will be used to analyze the effectiveness of teaching using a factor set, each of which consists of several items that must be scored on the 5-choice Likert scale (strongly disagree, disagree, agree or disagree, agree and strongly agree).

The choice of the SEEQ questionnaire has been founded on the advantages that [14] are described in its paper, which are: its psychometric properties [15], its wide use in universities around the world and the great amount of material available for further improvement of each analyzed items [14].

TABLE I : SEEQ QUESTIONNAIRE CATEGORIES

Categorie	Name
C1	Learning
C2	Enthusiasm
C3	Organization
C4	Group interaction
C5	Personal attitude
C6	Exams
C7	Bibliography
C8	General vision

In the adaptation of the SEEQ questionnaire, 8 categories have been used, as it is shown in Table I, with a total of 35 questions. In the first seven categories, the Likert scale is used, and in the eighth category, named "Overview", it is an open question with the aim that the students can express themselves openly and contribute those data that they believe that are not included in the previous questions. The analysis of this last category is not examined in this paper.

V. IMPLEMENTATION OF THE SEEQ QUESTIONNAIRE

Questionnaire application has always been carried out through anonymous surveys via "Google Forms" [16], which

allows students to answer at any moment when the questionnaire is available. Moreover, it has the obvious advantage of a quick feedback towards the teaching team. The questionnaire is available online through a direct link that can be accessed from the Moodle virtual classroom module. Thus, students can complete the questionnaires from the moment in which they have their final grades and diplomas until two weeks later approximately with the aim that their reflection on the questions are as aseptic as possible.

This questionnaire has been carried out since the academic year 2012-13 with the basic objective of maintaining a data evaluation history recorded in a file, but also, and more importantly, of being able to contrast students´ opinions from different academic year. Thus, in such a way, teaching team can check how methodological changes can be affecting the teaching-learning process, mainly in relation to the ECTS activities that students have realized, as described in different educational forums [17]. In this paper, we analyze the teacher improvement reflected on students´ opinions when introducing the use of Digital Storytelling [18] in the ECTS activities and content summaries gradually introduced by the teaching team in each topic. Therefore, at this time, there is a sample space of 81 answers collected along different courses.

VI. RESULTS ANALYSIS

For the results analysis, SPSS program [19] has been used, which allows an effective and very easy data analysis.

In this study we try to check if the students´ opinion mean score about the current course has changed compared to the previous courses one. A quick summary of such means comparison can be seen in Figure 1. But to determine whether these means changes are significant or not the performed statistical analysis is detailed in the following paragraphs.

First of all, we define the Null Hypothesis (H0), which represents the assertion that the use of the Digital Storytelling technique does not improve the teaching-learning process, and the Alternative Hypothesis (H1) that states that there is any relationship or dependence between the use of Digital Storytelling technique and teaching-learning process improvement [20]. Next, we detail the variance homogeneity test and normality test, both previous to the statistical test.

Prueba T

Estadísticas de grupo

	1 Si 0 No	N	Media	Desviación estándar	Media de error estándar
Aprendizaje	Cursos Anteriores	67	3,8557	,84332	,10303
	Curso Actual	14	4,2857	,58261	,15571
Entusiasmo	Cursos Anteriores	67	3,5634	1,00232	,12245
	Curso Actual	14	4,2679	,55871	,14932
Organización	Cursos Anteriores	67	3,3881	,94175	,11505
	Curso Actual	14	4,1786	,65360	,17468
Interaccion con el grupo	Cursos Anteriores	67	3,9366	,85540	,10450
	Curso Actual	14	4,4286	,42095	,11250
Actitud personal	Cursos Anteriores	67	3,8700	,93233	,11390
	Curso Actual	14	4,3929	,53001	,14165
Examenes	Cursos Anteriores	67	3,8731	,89757	,10966
	Curso Actual	14	4,4286	,54582	,14588
Bibliografia	Cursos Anteriores	67	3,3955	1,08550	,13262
	Curso Actual	14	3,9643	,71962	,19233

Figure 1. T test for independance samples in the groups, Current courses and Previous courses

A. *Uniformity of variances*

In order to perform the Levene test for equality of variances in SPSS it is necessary to perform the t-Student test [21]. T-Student test is applied for two independent samples [20] on the 7 categories of 5 point Likert questions from the evaluated questionnaire. The two independent samples are drawn from the means of the current course sample (2016-17) versus the means of the remaining courses samples, see Figure 1. The Levene test results of equal variance are shown in Figure 2.

Prueba de muestras independientes					
		Prueba de Levene de igual		prueba t para la igualdad	
		F	Sig.	t	gl
Aprendizaje	Se asumen v	1,014	0,317	-1,815	7
	No se asumen varianzas iguales			-2,303	25,89
Entusiasmo	Se asumen v	3,941	0,051	-2,54	7
	No se asumen varianzas iguales			-3,648	33,3
Organización	Se asumen v	1,684	0,198	-2,987	7
	No se asumen varianzas iguales			-3,779	25,7
Interaccion c	Se asumen v	5,481	0,022	-2,092	7
	No se asumen varianzas iguales			-3,204	39,34
Actitud pers	Se asumen v	4,281	0,042	-2,024	7
	No se asumen varianzas iguales			-2,876	32,56
Examenes	Se asumen v	2,209	0,141	-2,224	7

Figure 2. Levene test of equal variances by category.

In order to achieve the requirement of homoscedasticity (equality of variances) in the Levene test, the significance level must be a value greater than 0.05. But, before that, you need to know if you must consider the values from the upper or lower row. The decision must be taken on the basis of the values that appear in the "Sig." column, which will determine whether "Equal variances are assumed" is chosen or "Equal variances are not assumed" option is selected otherwise. Therefore, the Null Hypothesis (H0) would only be rejected in the case of "Learning" category, as shown in Figure 3

c1	Aprendizaje	0,073	Se Acepta H0
c2	Entusiasmo	0,013	Se Rechaza H0
c3	Organización	0,004	Se Rechaza H0
c4	Interaccion con el grupo	0,003	Se Rechaza H0
c5	Actitud personal	0,007	Se Rechaza H0
c6	Examenes	0,029	Se Rechaza H0
c7	Bibliografia	0,022	Se Rechaza H0

Figure 3. Acceptance or rejection of the Null hypothesis for each category.

B. *Normality.*

In order to determine the statistical test to be applied, in addition to analyzing the equality of variances for dependent variables, it should also be analyzed if the values taken on by variables follow a normal distribution [20]. For this case, the Kolmogorov-Smirnov (K-S) test or Shapiro-Wilks (S-W) test, among others, may be applied depending on the sample size. In this analysis, the S-W test has been chosen due to the fact that the population is less than 50. The SW test results are shown in Figure 4. Those data sets that do not follow a normal distribution are highlighted, which should be eliminated from the study.

Although there are several authors [22] that note that t-Student test is robust enough to apply even in the case that the normality assumption is not fulfilled, a nonparametric test will be applied in this study, in order to redress this data deficiency.

C. *Non parametric tests*

Since there are data sets that do not follow a normal distribution according to the S-W test results and some of categories do not meet the condition of equal variances, we must apply nonparametric tests. For this case, the Mann-Whitney U test proposed by Wilcoxon in the year 1945 [23] will be applied. In this test, the Null Hypothesis (H0) maintains that the mathematical expectations for both populations are equal.

The size of the samples may be different. It does not require any type of assumption about the samples distribution; for this reason, the U test can be applied for discrete or ordinal variables like other non-parametric tests.

The obtained results are shown in Figure 5. From this test, we can conclude that the introduction of Digital Storytelling technique can help improve the teaching-learning process in some categories, specifically in those named "Enthusiasm", " Organization "," Personal Attitude "and" Exams ".

Analyzing each category individually, we can note that in the category of "Enthusiasm", where there is a mean increase of 0.7 in absolute value; the item "8 - With its presentation of the subject, keep my interest during the whole class time" has the largest increase. Nowadays, no one doubts that the students must be motivated. Therefore, this technique will enhance students´ engagement. Consequently, we have contributed to improve students´ learning based on a methodological change achieved with the introduction of Digital Storytelling technique in ECTS.

Pruebas de normalidad				
	Curso	Shapiro-Wilk		
		Estadístico	gl	Sig.
Aprendizaje	2012	0,848	22	0,003
	2013	0,96	16	0,667
	2014	0,935	21	0,172
	2015	0,775	6	0,035
	2016	0,913	14	0,175
Entusiasmo	2012	0,741	22	0
	2013	0,956	16	0,599
	2014	0,956	21	0,441
	2015	0,858	6	0,182
	2016	0,933	14	0,331
Organización	2012	0,936	22	0,165
	2013	0,965	16	0,758
	2014	0,976	21	0,851
	2015	0,907	6	0,415
	2016	0,917	14	0,198
Interaccion c	2012	0,859	22	0,005
	2013	0,952	16	0,53
	2014	0,929	21	0,131
	2015	0,831	6	0,11
	2016	0,916	14	0,194
Actitud pers	2012	0,864	22	0,006
	2013	0,836	16	0,008
	2014	0,958	21	0,472
	2015	0,918	6	0,492
	2016	0,877	14	0,053
Examenes	2012	0,909	22	0,044
	2013	0,947	16	0,443
	2014	0,919	21	0,084
	2015	0,908	6	0,421
	2016	0,884	14	0,067
Bibliografia	2012	0,935	22	0,16
	2013	0,906	16	0,101
	2014	0,947	21	0,303
	2015	0,64	6	0,001
	2016	0,89	14	0,08

Figure 4. Shapiro-Wilk Normality Test

The category named "Organization" is assessed by four items. That one that has a significant increase is the one referring to "12. The way this teacher has exposed the subject has facilitated the taking of notes." followed by the item: "9. The teacher's explanations have been clear." In order to achieve an effective learning, it is very convenient that the teaching team has properly planned all the tasks to be carried out as well as established connections between new concepts and what the students have learned before.

In the "personal attitude" category, which has up to 8 items which are used to measure it for all the students, there is also an increase, though lower than that in other categories (0.5 in absolute value), probably because it is already graded in a high level 3.87 close to 4. However this category was not initially part of the ones to improve since the methodology change in the ECTS activities does not imply a change in the personal attitude of the teaching team. Same comment can be made about the "Exams" category, which has a slight increase (0.55 in absolute value). Again, this category is one of the highest mean grade in all courses.

Resumen de prueba de hipótesis

	Hipótesis nula	Prueba	Sig.	Decisión
1	La distribución de Aprendizaje es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	81,000	Retener la hipótesis nula.
2	La distribución de Entusiasmo es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	9,000	Rechazar la hipótesis nula.
3	La distribución de Organización es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	3,000	Rechazar la hipótesis nula.
4	La distribución de Interaccion con el grupo es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	53,000	Retener la hipótesis nula.
5	La distribución de Actitud personal es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	32,000	Rechazar la hipótesis nula.
6	La distribución de Examenes es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	26,000	Rechazar la hipótesis nula.
7	La distribución de Bibliografia es la misma entre las categorías de Curso Actual.	Prueba U de Mann-Whitney para muestras independientes	62,000	Retener la hipótesis nula.

Se muestran significaciones asintóticas. El nivel de significación es de ,05.

Figure 5. Mann-Whitney's test

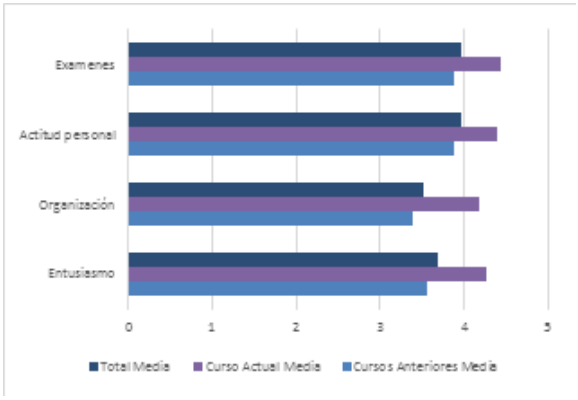

Figure 6. Average of the categories of the Current Course compared to the previous ones

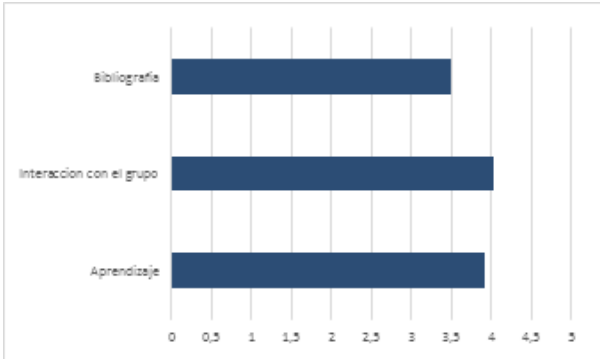

Figure 7. Average of rest categories.

Finally, in Figure 7 we show the means of all courses for the three categories in which the comparison of means increase or decrease cannot be made statistically. But it should be said that initially they have high values, well above core value 3. Among these categories, "Interaction with the group" stands out and within this category, the item named "14. Students have

been invited to share their knowledge and ideas" is assigned the highest score (4,6).

VII. CONCLUSIONS

In this contribution we have analyzed the students´opinion of the course period 2016-17 comparing to the students´ opinions from previous courses, beginning data collection in the course period 2012-13 in the Information Security module [1] through the validated questionnaire SEEQ [14]. Then, we have statistically analyzed each category means, differentiating those ones which could be statistically characterized by a significant increase in the current course mean. Then, we can conclude that it should be due to the introduction of the Digital Storytelling technique, as it is the only methodology change in the current course compared to the previous ones.

On the other hand, the introduction of this technique has been done as a pilot research test within the IRNET project [24] in which some of this paper authors take part in. From the obtained results, there are several ongoing experiments based on Digital Storytelling technique that are being implemented in different Engineering Degrees modules, such as Systems Interconnection and Computer Networks, in order to be able to measure the impact that this technique application has in higher education.

Consequently, as shown in Figure 6 and Figure 7, all the means are above the central value, and mostly around 4, which is a positive tendency toward a better teaching attitude when measured throughout the SEEQ questionnaire. This fact encourages the teaching team to continue progressing on this line of work in the coming courses.

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