THE INTERNET AS A TOOL FOR IMPROVING THE STUDENT EVALUATION OF TEACHING

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Abstract: This paper describes a methodology to assess the quality of teaching using a web based tool, which has been developed and implemented in the School of Civil Engineers of the Technical University of Madrid (UPM). The software has been developed using a combination of tools freely available and widely used. Students use the Internet to fill out and send the questionnaires. Each questionnaire has three items: subjects, teachers and general comments. The system guarantees the student answers anonymity. It also assures each student can only evaluate those courses and teachers for which they are enrolled and can only evaluate them once. The evaluation results have been divulgated by a process where teachers and students right to know the results and personal data protection right have been joined. The methodology was implemented four years ago. By now there is enough evidence to verify that results have been very successful.

1 INTRODUCTION

Quality assessment of the activity is a mandatory requirement in a public organization (Reid, 2001). Due to this demand, public universities periodically evaluate the quality of their activities, mainly teaching (Martin-Carrasco and Fraile, 2008; Ghedin and Aquario, 2008). One of the traditional components of this assessment is the student opinion about teaching (Kitsuse, 2009; Kember et al., 2002). Nowadays, the best procedure to know this opinion is to ask the students by a survey (Sproule, 2000). The most common teaching quality survey is the paper-and-pencil questionnaire, consisting in the distribution of a sheet with the questionnaire in the classroom, which each student must complete (Wang et al., 2005; Dommeyer et al., 2004). Then, after data processing, each subject and teacher results are sent to interested parties.

This paper describes a new methodology for conducting surveys on the quality of teaching, which has been developed in the School of Civil Engineers of the UPM, and first implemented in the 2005-06 academic year. It is an integral process, which considers, reviews and improves each step of the traditional assessment process, from the questionnaire to the results divulgation. While one of the features of the methodology is its web based process to complete the questionnaires (Anderson et al., 2005), there are other innovative steps, highlighting the legal and technical analysis which has been developed to determine how to divulgate the results. The methodolgy has been validated, showing its practical viability and effeciency.

The main purpose of the system is the quality assessment of the teaching activity and the learning quality of subjects (Algozzine et al., 2004; Ratz, 1975). In addition, the methodology allows students to express their points of view and suggestions on other aspects of the school, such as facilities, library, dining room, administrative staff and any other operative service. Even the system itself has been subject to assessment, so that students can discuss their experience as users to improve the system in next years (Nulty, 2008). References to a similar procedure for the assessment of the teaching quality implemented in any other Spanish University were not found.

The paper has been organized as follows. Firstly, the methodology for developing the telematic system, conducting the surveys and disseminating the results is presented. Secondly, the new system for conducting surveys is compared to traditional methods. Finally, future improvements and conclusions are presented.

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2 METHODOLOGY DESCRIPTION

The methodology has been divided in two sections. Firstly, the design and implementation of a telematic system for conducting surveys on the teaching quality is presented. Then, the presentation of results and their divulgation to all the teachers and students, in a personal way depending on the degree of representativeness that each of them holds, is presented.

2.1 Telematic System

The first step is the design and implementation of a new telematic system, which allows students to conduct surveys on the teaching quality by the Internet. The system has been installed on an Apache server which works on Linux. Web developments have been achieved in PHP 4.0 language and MySql has been used as a database engine. These tools, all freely available, are widely used in web developments.

Students data (subjects for which they are enrolled) and teachers data (subjects for which they teach) have been provided by the Administrative Office and Departments of the School.

Students access and authentication into the system is carried out through the virtual area of the School, where each student already has its own access password, avoiding an additional complexity to the process. Once the student is authenticated, the login is kept throughout the connection. Each page checks that this access has been made through the previous athentication. The page and questionnaire format keeps the previous style used in the virtual area of the School, so that students will not realize the difference between the two applications. The use of a cascading style sheets application makes it easily adaptable to other environments.

Pages have a maximum width of 600 points, so that these can be printed on an A4 sheet size, as students must print their survey to save their answers. After survey submission, students will not be able to access their answers again, since each answer is stored without any reference to the person who has submited it, for the safety of the anonymity.

Available data to be introduced in each field are restricted to allowable data from that field database. This restriction has been carried out by JavaScript scripts to avoid a high server load while a client run, also resulting in a faster response in case of error.

For the safety of the survey results, daily backups are carried out and a second MySQL is being performed for making a database backup.

Once the evaluation period is expired, which lasts the month of May, results data are recovered by Sql scripts and imported in an Excel sheet, which is specially designed for its final presentation.

2.2 Methodology for Conducting the Surveys

As said before, students can access the system by the only requisite of being registered as users in the virtual area of the School (all students are registered from the date of the beginning of their studies in the School). Once logged in, the list of subjects in which the student is enrolled is showed (Fig. 1). One of them must be selected to proceed to the corresponding survey about the subject itself or the teachers of it.

In the case of conducting the survey of the subject itself, a list of questions is shown (Fig. 2). The student must answer ticking one of the boxes for each question. The student has an available field to freely express his comments and suggestions about the subject, with a maximum length of 500 characters.

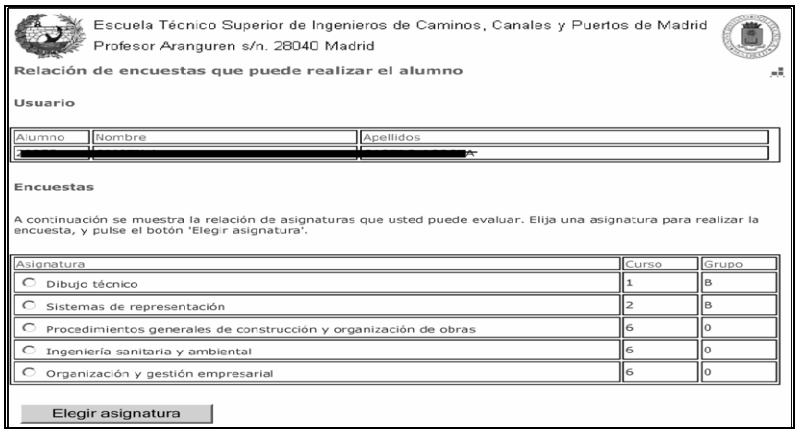
If the survey about the teachers is selected, a list of the teachers who lecture that subject is shown. The student must select those who wish to evaulate and a list of questions is shown (Fig. 3). The student must tick one box between 1 and 10 for each question. The student has also an available field to freely express his comments about the teacher.

Once the survey of a subject or a teacher is finished, the student can not modify or conduct again it (it disappears from the list of subjects that is shown). After that or with a later login, he can conduct the remaining surveys for other subjects and teachers.

Furthermore, in the initial page, where the student selects the subject that wishes to evaluate, four fields have been displayed, in which he can express his opinions about the pre-freshman course (4 weeks intensive course), the final-year project, the School as a whole and the telematic assessment process itself.

2.3 Results Presentation

A set of tables and figures has been developed for the presentation of the results, which summarize the huge amount of information generated by surveys.



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Relación de encuestas que puede realizar el alumno

Usuario

Alumno	Nombre	Apellidos
[redacted]		

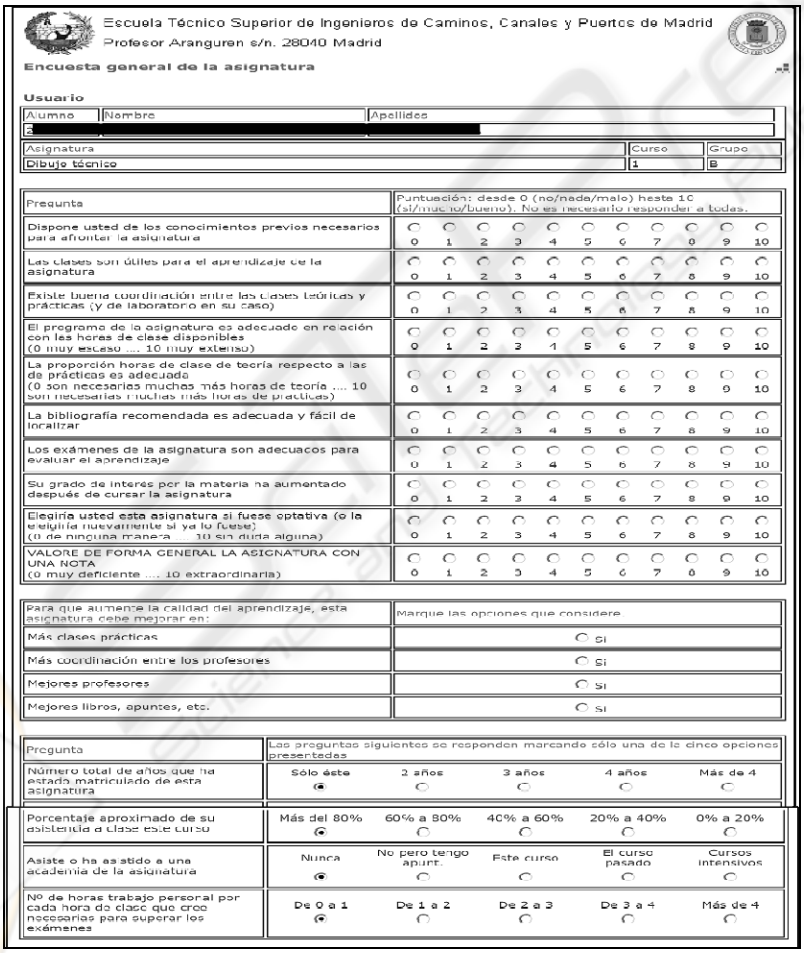
Encuestas

A continuación se muestra la relación de asignaturas que usted puede evaluar. Elija una asignatura para realizar la encuesta, y pulse el botón 'Elegir asignatura'.

Asignatura	Curso	Grupo
Dibujo técnico	1	B
Sistemas de representación	2	B
Procedimientos generales de construcción y organización de obras	6	0
Ingeniería sanitaria y ambiental	6	0
Organización y gestión empresarial	6	0

Elegir asignatura

Figure 1: Form to access the assessment questionnaires.



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Encuesta general de la asignatura

Usuario

Alumno	Nombre	Apellidos
[redacted]		

Asignatura	Curso	Grupo
Dibujo técnico	1	B

Pregunta	Puntuación: desde 0 (no/nada/malo) hasta 10 (sí/mucho/bueno). No es necesario responder a todas.
Dispone usted de los conocimientos previos necesarios para afrontar la asignatura	0 1 2 3 4 5 6 7 8 9 10
Las clases son útiles para el aprendizaje de la asignatura	0 1 2 3 4 5 6 7 8 9 10
Existe buena coordinación entre las clases teóricas y prácticas (y de laboratorio en su caso)	0 1 2 3 4 5 6 7 8 9 10
El programa de la asignatura es adecuado en relación con las horas de clase disponibles (0 muy escaso .... 10 muy extenso)	0 1 2 3 4 5 6 7 8 9 10
La proporción horas de clase de teoría respecto a las de prácticas es adecuada (0 son necesarias muchas más horas de teoría .... 10 son necesarias muchas más horas de prácticas)	0 1 2 3 4 5 6 7 8 9 10
La bibliografía recomendada es adecuada y fácil de localizar	0 1 2 3 4 5 6 7 8 9 10
Los exámenes de la asignatura son adecuados para evaluar el aprendizaje	0 1 2 3 4 5 6 7 8 9 10
Su grado de interés por la materia ha aumentado después de cursar la asignatura	0 1 2 3 4 5 6 7 8 9 10
Elegiría usted esta asignatura si fuese optativa (o la eligiría nuevamente si ya lo fuese) (0 de ninguna manera .... 10 sin duda alguna)	0 1 2 3 4 5 6 7 8 9 10
VALORE DE FORMA GENERAL LA ASIGNATURA CON UNA NOTA (0 muy deficiente .... 10 extraordinaria)	0 1 2 3 4 5 6 7 8 9 10

Para que aumente la calidad del aprendizaje, esta asignatura debe mejorar en:	Marque las opciones que considere
Más clases prácticas	Si
Más coordinación entre los profesores	Si
Mejores profesores	Si
Mejores libros, apuntes, etc.	Si

Pregunta	Las preguntas siguientes se responden marcando sólo una de la cinco opciones presentadas				
Número total de años que ha estado matriculado de esta asignatura	Sólo éste	2 años	3 años	4 años	Más de 4
Porcentaje aproximado de su asistencia a clase este curso	Más del 80%	60% a 80%	40% a 60%	20% a 40%	0% a 20%
Asiste o ha asistido a una academia de la asignatura	Nunca	No pero tengo apunt.	Este curso	El curso pasado	Cursos intensivos
Nº de horas trabajo personal por cada hora de clase que cree necesarias para superar los exámenes	De 0 a 1	De 1 a 2	De 2 a 3	De 3 a 4	Más de 4

Figure 2: Subject evaluation questionnaire.

These tables and figures are simple enough to make quick comparisons between results, but have an enough detail to analyze each individual case.

The design of these tables and figures has been very labour-intensive. Nine tables have been developed:

Tables 1 and 2: Evaluation of the subjects, sorted by course and by assessment results (Fig. 4).

Tables 3 and 4: Evaluation of the teachers, sorted by subject and by assessment results (Fig. 5).

Table 5: Graphics of the results distribution of the teachers evaluation (Fig. 6).
Table 6: Comments on subjects.
Table 7: Comments on teachers.
Table 8: Comments on the final-year project and the pre-freshman course.
Table 9: Comments on the School and on the survey itself.

2.4 Dissemination of Results

Transparency and publicity of the survey results improve the quality of teaching. If the results are hidden, the surveys will not be effective. For this reason, the survey results have been divulgated as widely as the UPM regulations and Spanish Data Protection Law allows. The current legislation has been studied in detail and legal advisors have been consulted on the most doubtful aspects.

Each teacher has the right to receive his personal evaluation. At first, no one else should receive it, because teaching evaluation is considered as personal data, and therefore this information is restricted to the cases collected by the Law. But, as an exception, the members of the School governing body, i.e. the School Board and the Department Board, have the right to know the evaluations of all the other teachers within the scope of the body, in order to have the most complete information about each case. Because of this, to join the maximum dissemination and the data protection, different documents have been developed, each of them targeting a specific area and staff. One of the documents (Divulgative Document) is available to anyone who requests it, mostly students, and it is sent in pdf format.

2.5 Additional Developments

In addition to the two main parts of the developed system methodology (the telematic system for conducting surveys and the presentation and divulgation of results), other additional works have also been developed.

The survey forms have been designed taking into account that are going to be filled out on the Internet. The forms have three distinct parts, i. e. subjects, teachers and general comments, which are activated by pressing the corresponding buttons. The answers are bounded, so that students can only tick one of the offered answers.

Questionnaire questions have been defined after a comparative analysis of many questionnaires from other schools and universities. Efforts were made to select questions that really incide on the quality of teaching, including contrast questions to evaluate the quality of results. Finally, 10 questions have been set for subject assessment and 10 for teacher assessment. The questions are simple, short, with clear language and, relevant for the person evaluated and for the university.

Authors have carried out several divulgative conferences on the new methodology to the students, in order to present the new method and to know their opinions. Some of these opinions and comments advised to include some changes to the initially planned procedure.

The system has also promoted the use of the virtual area. This is a resource that the School offers to teachers and students. It has a huge potential because, as a web based tool, it enables the communication between teacher and student without constraints of time or place. However, this is a seldom used resource, which has been known by many students through this new system to conduct surveys.

3 COMPARISON WITH TRADITIONAL METHODS

Surveys to assess the quality of teaching have been conducted in our school for many years. The traditional system was to distribute in the classroom, in a single day near the end of the course, a few pages with questionnaires that students should fill out. Once the surveys were completed and after the slow and costly processing of results, these were given to each teacher and to the Director of the Department.

After the implementation of the presented system, the surveys, with updated forms and aimed at improving the quality of teaching, enable a more complete, accurate and faster assessment. The survey results, as being available in digital format, can be processed more efficiently. Moreover, the results are summarized and presented by some specially designed tables, which allow the comparison of results. Speed and accuracy in data processing has been tested, as the documents described above had been developed one month after the completion of the surveys.

Previously, traditional methods of survey led to a very labour-intensive data processing, which needed to handle by hand thousands of questionnaires, with very high costs and calculation errors, so that the

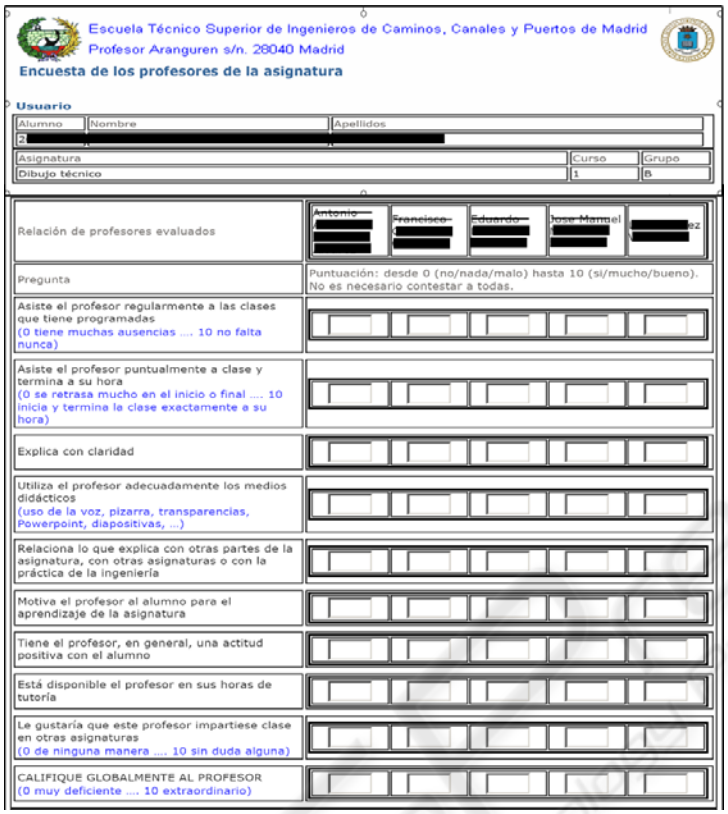

Figure 3: Teacher evaluation questionnaire.

results were never available before six months after the completion of the surveys. The rapid availability of results allowed by this new methodology, added to the use of e-mail to speed up its distribution and to reduce costs, allow teachers to draw their own conclusions, being these put into practice from the beginning of next academic year.

Widespread dissemination of results, observing the law restrictions, breaks with traditional obscurantism of the survey results and turns them into an effective tool to improve the quality of teaching. Each teacher can compare his results with that from other teachers in their subject, Department or School. The students, which have access to the results of teaching evaluation for the first time, something that had never happened before with traditional methods, feel to contribute to the system, find that their opinions are properly transmitted and are more motivated to participate in next courses.

The participation of students is not easy to quantify by comparing the number of surveys that have been completed by the new system with those by traditional systems, due to the difficult data handle and location from those previous years. However, Table 1 shows the increasing number of teachers and subjects assessed in recent courses compared to previous courses.

It can be seen that the last years have tripled the number of completed surveys and more teachers have been assessed, from those of the first year of implementation. These results show an increasing trend in the use of this system for conducting the surveys, which confirms that it is being successfully implemented.

In addition, the evaluation of the system by the students has been very succesful, as they have stated in the reserved field for this purpose in the questionnaire (Table 9 of the results).

4 FUTURE IMPROVEMENTS

As the system has been implemented for the last two courses, some elements have been identified as improvable: reducing of the questionnaire length, changing the date for conducting the surveys, promoting the use of he virtual area, etc. Other possible improvements have been suggested by teachers and students.

Tabla 2. Resumen de la evaluación de las asignaturas con 5 ó más encuestas

CUESTIONES:

Nº Número de respuestas
A1 Dispone usted de los conocimientos previos necesarios para afrontar la asignatura
A2 Las clases son útiles para el aprendizaje de la asignatura
A3 Existe buena coordinación entre las clases teóricas y prácticas (y de laboratorio en su caso)
A4 El programa de la asignatura es adecuado en relación con las horas de clase disponibles
A5 La proporción de horas de clase de teoría respecto a las de prácticas es adecuad
A6 La bibliografía recomendada es adecuada y fácil de localizar
A7 Los exámenes de la asignatura son adecuados para evaluar el aprendizaje
A8 Su grado de interés por la materia ha aumentado después de cursar la asignatura
A9 Elegiría usted esta asignatura si fuese optativa (o la elegiría nuevamente si ya lo e
A10 **Valore de forma general la asignatura**

NOTA 1: Los resultados varían desde 0 (no/nada/malo) hasta 10 (sí/mucho/bueno)

Resultados ordenados por "*A10: Valore de forma general la asignatura*" 2006/07 2005/06

Cód.	Asignatura	Curso	Especialid.	Nº	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A10
6239	Infraestructuras de carreteras y aeropuertos	6º	Transporte	9	8,0	9,1	8,1	6,8	6,4	8,0	8,1	9,0	9,7	8,9	9,0
6464	Presas I	6º	Hidráulica	8	7,6	8,3	7,1	6,4	4,7	6,3	6,9	8,3	9,1	8,4	9,5
6465	Presas II	6º	Hidráulica	5	7,8	8,2	7,3	6,8	4,3	6,6	9,3	8,6	9,2	8,2	9,7
3126	Geología aplicada	3º		12	6,8	8,7	6,9	5,6	5,8	6,2	6,5	8,8	8,5	8,1	6,7
5034	Obras hidráulicas	5º		21	7,1	8,4	7,3	6,3	6,2	6,1	7,1	7,8	7,9	8,0	7,7

Figure 4: Subjects evaluation summary (part of Table 2).

Tabla 4. Resumen de la evaluación de los profesores con 5 ó más encuestas

CUESTIONES:

Nº Número de respuestas
P1 Asiste regularmente a las clases que tiene programadas
P2 Asiste puntualmente a clase y termina a su hora
P3 Explica con claridad
P4 Utiliza adecuadamente los medios didácticos: voz, pizarra, transparencias, Powerpo
P5 Relaciona la asignatura con otras asignaturas o con la práctica de la ingeniería
P6 Motiva al alumno para el aprendizaje de la asignatura
P7 Tiene, en general, una actitud positiva con el alumno
P8 Está disponible en sus horas de tutoría
P9 Le gustaría que este profesor impartiese clase en otras asignaturas
P10 **Valore de forma general al profesor**

NOTA 1: Los resultados de P1 a P10 varían desde 0 (no/nada/malo) hasta 10 (sí/mucho/bueno)

Resultados ordenados por "*P10: Valore de forma general al profesor*" 2006/07 2005/06

Nombre	Asignatura	Curso	Espec.	Nº	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P10
[redacted]	Presas I	6º	Hidr.	8	10,0	9,6	9,4	8,4	9,5	9,3	9,5	8,7	9,3	9,4	9,2
[redacted]	Inglés II	4º		7	9,3	7,9	9,3	9,7	8,7	9,0	9,3	9,0	8,4	9,1	
[redacted]	Resistencia, elasticidad y p	3º		8	9,8	9,0	9,1	8,0	8,9	9,1	9,4	8,8	9,7	9,1	
[redacted]	Puertos y Costas	5º		11	9,3	8,3	8,6	8,6	8,4	9,6	9,6	9,1	9,6	9,1	8,6

Figure 5: Teachers evaluation summary (part of Table 4).

The most important aspect to be improved is the student participation, which has not increased as it was expected. The two main causes indicated by the students are: concern about the anonymity of answers, because they must identify themselves to access the system, and the traditional lack of confidence in the teaching evaluation surveys, which are considered as a useless activity that until now has been for nothing (Beran et al., 2009; Giesey et al., 2004). Concern about the anonymity of answers is mainly due to the system novelty (Oliver and Sautter, 2005). Previously, all the surveys were conducted on paper, answering on a page where the student was not identified. However, the new telematic system requires the student to identify himself as a user of the system, which has aroused some suspicion, although it was warned that the answers were added to the database without any reference to the person who completed it. However, after the students verificate the real anonymity of answers, an increasing participation is expected for the next course.

The traditional lack of confidence in the surveys to improve the quality of teaching is a widespread opinion among the students. It is mainly due to the obscure divulgation procedure that had been used previously. Only the teacher himself knew the results of their surveys and also sometimes the Director of the Department. This lack of transparency affected the students, who were blinded to the results of the evaluation that they had completed. It is expected that the new dissemination system, which allows the students to know the survey results, will lead to the students feeling of contribution to the system and becoming more involved in next years.

5 CONCLUSIONS

This paper has presented a methodology to assess the quality of teaching. It has been developed and implemented in the School of Civil Engineers of the UPM. All the stages of the process are novel, highlighting the presentation and divulgation of results.

The implemented telematic system uses freely available software tools, commonly used in web developments.

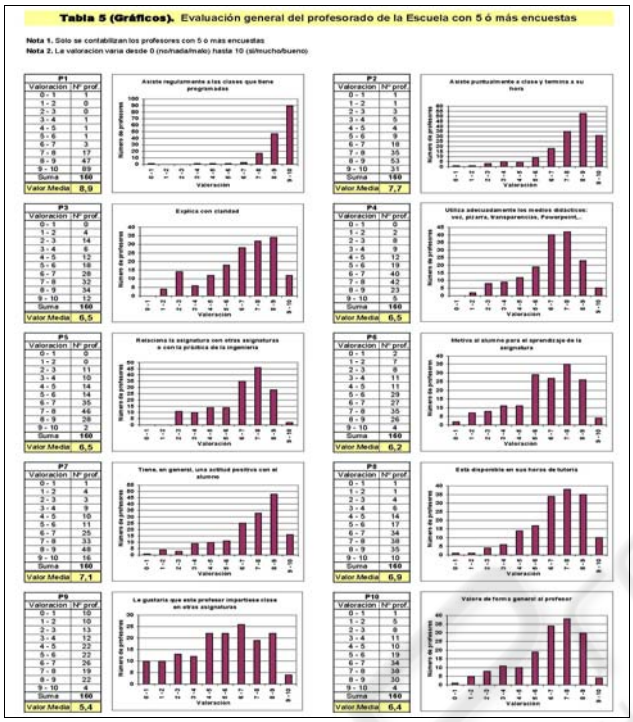

Figure 6: Results distribution of teachers evaluation (Table 5).

Table 1: Comparison between web based and traditional surveys.

Academic year	Evaluated teachers per course								Evaluated subjects	Number of surveys	
	Bridge course	1st	2nd	3rd	4th	5th	6th	Total		Teachers	Subjects
Internet based system											
2008-09		34	29	40	37	62	69	271	64	3.126	1.237
2007-08		32	32	35	36	67	71	273	68	3.449	1.352
2006-07	1	41	24	36	31	60	63	256	68	2.263	1.022
2005-06	6	28	30	28	30	51	62	235	68	908	535
Traditional system											
2004-05	0	7	13	36	38	29	59	182	48		
2003-04	0	10	26	22	26	56	58	198	59		
2002-03	No data										
2001-02	No data										
2000-01	0	9	15	0	16	28	38	106	35		

Note: The number of students in the School was 1800, as the average over the last five years, but those who regularly attended the classes were around 950. The number of students who filled out the surveys is about the fifty percent of the latter.

To simplify the students login and authentication, it makes good use of an already established system, which is the virtual area of the School. Once logged in, students gradually access to a number of forms that allow them to complete the surveys of subjects, teachers and comments, activating the corresponding commands.

To make the presentation of the results easier, 9 tables and graphs have been carried out, which summarize the huge amount of information generated by the surveys and facilitate its consultation. The dissemination of the results is believed to be essential for the proper operation of any teaching assessment system. This divulgation has been based on joining the teachers and students right to know the evaluation results and the right to

personal data protection collected by the current law. To satisfy both rights, initially opposed, a personal divulgation has been made, which reflects the situation of each receiver, and different documents have been developed to achieve this rule, each of them targeting a specific group. It must be emphasized that one of these documents, called Divulgative Document, is only available in pdf format and is distributed by the Internet, reducing costs.

The system was introduced five years ago with very successful results, which are much better than those of previous traditional procedures.

REFERENCES

Algozzine, B., Beatti, J., Bray, M. et alteri, 2004. Student evaluation of college teaching: A practice in search of principles. College Teaching. Vol. 52, nº 4, pp. 134-141.

Anderson, H.M., Cain, J., Bird, E., 2005. Online student course evaluations: Review of literature and a pilot study. American Journal of Pharmaceutical Education. Vol. 69, nº 1. pp. 34-43

Beran, T., Violato, C., Kline, D., Frideres, J., 2009. What do students consider useful about student ratings? Assessment & Evaluation in Higher Education, Vol. 34, nº 5, pp. 519-527.

Dommeyer, C.J., Baun, P., Hanna, R.W., Chapman, K.S., 2004. Gathering faculty teaching evaluations by in-class and online surveys: their effects on response rates and evaluations. Assessment and Evaluation in Higher Education, Vol. 29, nº 5, pp. 611-623

Ghedin, E. and Aquario, D., 2008. Moving towards multidimensional evaluation of teaching in higher education: A case study across four faculties. Higher Education, Vol. 56, nº 5, pp. 583-597.

Giesey, J.J., Chen, Y.N. and Hoshower L.B., 2004. Motivation of engineering students to participate in teaching evaluations. Journal of Engineering Education, Vol. 93, nº 4, pp. 303-312.

Kember, D., Lueng D.Y.P. and Kwan K.P., 2002. Does the use of student feedback questionnaires improve the overall quality of teaching? Asessment and Evaluation in Higher Education. Vol. 27, nº 5, pp. 411-425.

Kitsuse, J.I., 2009. Talk about teaching: reflections on the problem of teaching evaluation. The American Sociologist. Vol. 40, nº 1-2, pp. 3-14.

Martin-Carrasco, F.J., Fraile, J., 2008. La evaluación de la docencia: ventajas e inconvenientes del procedimiento DOCENTIA propuesto por la ANECA. II Jornadas Internacionales UPM sobre Innovación Educativa y Convergencia Europea.

Nulty, D.D., 2008. The adequacy of response rates to online and paper surveys: what can be done? Assessment & Evaluation in Higher Education, Vol. 33, nº 3, pp. 301-314.

Oliver, R.L., Sautter, E.P., 2005. Using course management systems to enhance the value of student evaluations of teaching. The Journal of Education for Business, Vol. 80, nº 4, pp. 231-234.

Ratz, H.C., 1975. Factors in the evaluation of instructors by students. IEEE Transaction on Education, Vol. 18, nº 3, pp. 122-127.

Reid, I.C., 2001. Reflections on using the Internet for the evaluation of course delivery. The Internet and Higher Education, Vol. 4, nº 1, pp. 61-75.

Sproule, R., 2000. Student evaluation of teaching: A methodological critique of evaluation practices. Education Policy Analysis. Vol. 8, nº 50.

Wang, Y., Lee, C., Lew-Ting, C., Hsiao, C.K., Chen, D., Chen, W.J., 2005. Survey of substance use among high school students in Taipei: Web-based questionnaire versus paper-and-pencil questionnaire. Journal of Adolescent Health, Vol. 37, pp. 289-295.