

Providing privacy and contextual information to a web-based communication system of marks and grades

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This paper presents a web-based system for communicating exam marks privately, which has been recently incorporated into Tutor, a web-based educational support platform for university-related teaching, learning and academic data management. This system allows students to know their grades at any moment and in any place with access to Internet, avoiding the need for them to go to their faculty in order to check if their test results have been published or not. The system offers full information about own marks and grades to students and teachers, and contextual information about peers' ones. In this way, personal data privacy is preserved, contextual information is provided and some statistical graphics are generated in order to supply valuable complementary information to the university community.

Keywords web-based educational environment; data privacy; marks and grades

1. Introduction

Traditionally, when teachers communicate the result of an exam or test, they expose a list with students' personal information and their corresponding marks in a public place. Everyone who passes over there can therefore see all student marks, and this invades students' data privacy. Frequently, not only student's name but also some more delicate personal data like ID card number are included in the list. ID card number is often used to many other functions, such as user authentication on some web systems. Consequently, this data privacy violation should be avoided. In order to do that, we have added a recently-developed module to Tutor (<http://tutor.ugr.es>) [1, 2], which is a web-based system for supporting the teaching and learning of university courses that manages all the academic data (of students, teachers, subjects, etc.) related to this courses. This module respects each user's data privacy, since it only shows his/her own marks. No other user (apart from the teacher who assesses him/her) can therefore access to that information. But a new problem arises from this solution. Students lose contextual information about their marks, since they cannot compare their own grades with their classmate's ones. Tutor solves this problem providing students with useful but not harmful contextual information about their marks, and generating pie charts of grades at three levels: class group, subject, and teacher who assesses them (the teacher who marks a student's exam can be different from the one who teaches the group s/he belongs to). In this way, every student is able to see not only his/her grade but also his/her ranking position and pie charts showing the number and percentages of students grouped by marks at the three levels mentioned.

Furthermore, Tutor allows the students to know their grades at any moment and in any place with access to Internet, avoiding the need for them to go to their faculty in order to check if their test results have been published or not. This is a great advantage, especially during the period of the academic year in which they do not have to attend classes and they have to consult a lot of marks, i.e. in June, July and September.

Teachers are responsible for assessing students, and they also need some contextual information about marks that does not violate data privacy. Since a subject may be taught in several groups, and different

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groups can have different teachers, they should be able to compare their marks with their colleagues' ones in the context of the same subject. But each teacher should not see which specific marks give their peers to each of their students, since this could be considered a privacy violation for both teachers and students. Instead that, Tutor shows pie charts of marks for each group and for the whole subject, providing in this way useful contextual information for teachers, who can know their contribution to each percentage.

In summary, Tutor offers full information about own marks and grades to students and teachers, and contextual information about peers' ones. In this way, personal data privacy is preserved, contextual information is provided and some statistical graphics are generated in order to supply valuable complementary information to the university community.

In the rest of the paper, we give more details about this communication system of marks and grades. In Section 2 we explain the part of this system that is seen by each student, while we describe the part seen by teachers in Section 3. Finally, we present the conclusions in the last section.

2. Student's view: Data privacy and contextual information

When students access to their restricted section (they have to authenticate previously in the system) and choose the option *Grades* from the menu of this section, a similar screen to the one shown in Figure 1 is displayed, which allows them to know their exam and test marks.

The screenshot shows the Tutor system interface. At the top, there is a navigation menu with options: Presentación, Miembros, Asignaturas, Enlaces, Restringido (highlighted), Avisos, and Sugerencias. Below the menu, the title is 'Notas de JUAN ALUMNO EJEMPLO' with a 'Lista Imprimible' link. Two dropdown menus allow selection of 'Asignatura' (Informática Aplicada a la Gestión de la Empresa) and 'Curso' (2004/05). The main content area displays a table of grades for 'Informática Aplicada a la Gestión de la Empresa' in 'Grupo C' for 'Curso 2004/05'. The table has columns for 'Nota', 'En convocatoria', 'Posición', 'Calificación', 'Gráficas', and 'Información'. The 'Nota' column shows '7,2' and 'Examen Ordinario de Junio'. The 'Posición' column shows 'Grupo', 'Asignatura', and 'Profesor' with progress bars. The 'Calificación' column shows 'NOTABLE'. The 'Gráficas' column shows 'Grupo', 'Asignatura', and 'Profesor' with pie charts. The 'Información' column shows a red exclamation mark icon. A red banner at the bottom states: 'Ha subido nota, gracias a los trabajos realizados durante el curso'.

Fig. 1 Screen shot that shows the grades of a student within his/her restricted section (in Spanish).

Next we will describe the meaning of each element shown in Figure 1, where the first information indicated is the student's complete name (1), followed by a link (2) that allows to print all the information shown in that page. Two combo boxes (3 and 4) allow to consult only the marks corresponding to a specific subject of a concrete academic year, selecting the appropriate values, although both pull-down lists have as default values the ones that show all the subjects and all the academic years respectively.

The grades are presented in a table like the one shown in the figure. The name of the subject (5), the group the student belongs to (6) and the academic year (7) of the corresponding marks is indicated in its first row. Each mark shown in one of these tables occupies a row. The meaning of each one of its cells is explained next:

■ Cell 8 shows the numeric mark obtained by the student in the exam or exercise indicated in cell 9. Moreover, the qualitative (not numeric) grade obtained is shown (in cell 11) in some cases, since this is optional information that teachers can input or not.

■ Cell 10: As we have commented, for privacy reasons students only has access to their own results and never to those of the others. They know their marks, but they do not know the specific results of their classmates. They need to answer some questions, such as how many students did the exam, how many passed it, how good or bad have been the results in general, etc., in order to value their marks with respect to the ones of the others. With the aim of answering these questions, this cell indicates the position that the student occupies in three categories: the group (i.e. among their classmates), the subject (i.e. taken into account the students of all the groups) and the teacher who marks the exam or exercise (i.e. among those students that have been assessed by the same teacher). This information is given in two different ways: a visual one, using a system of colours, and another numerical one. In the latter, two values separated by the symbol “/” indicate the position that the mark obtained by that student occupies (marks put in order from the biggest one to the smallest one) and the total number of students who did the exam, respectively. It should be noted that in the example of the figure, this student occupies the same position (he/she has the same values) in the first and third categories, because in this case the teacher who lectures to that group is who has marked the exams; although there are subjects in which the teacher who marks an exam does not have to be who lectures to that student. For the visual information the three colours of a traffic light have been chosen: red (if the student is among the third of students with worst marks), yellow (if he/she is in the following third), and green (if he/she is among the third of the best). Moreover, among those with the same colour, the student who has better mark than another will have more bars advancing towards the following level, which allows him/her to value more adequately his/her position within the corresponding category.

■ Cell 12: The student can also access to a graphical statistical summary of the results obtained by the rest of students enrolled on that subject. A pie chart is shown for each of the three categories mentioned in the previous paragraph: group, subject and evaluator teacher. Clicking on some of the three icons of this cell (for example, on the one in the middle) a screen like the one shown in Figure 2 is displayed. This figure shows the number (in the legend) and percentage of students who did not that exam, and the number of students that obtained every grade considered by the teacher when he/she introduced the marks (there are several templates for that). In this case, the grades (in Spanish) are: *Suspense* (F), *Aprobado* (C), *Notable* (B), *Sobresaliente* (A) and *Matrícula de Honor* (A+).

■ In cell 13 there are two circular icons, which can be emphasized (with colour) or disabled (grey scaled), depending on their availability. Their linked information is shown/hidden in cell 14 by clicking on any of these icons. The first one shows any comment or note (related to that mark) that the teacher wants to communicate to that specific student, who is the unique user who can access and read it. The second one shows public information for all the students of that group, as the schedule for checking and revising the answers of the exam, or how each exercise has been marked.

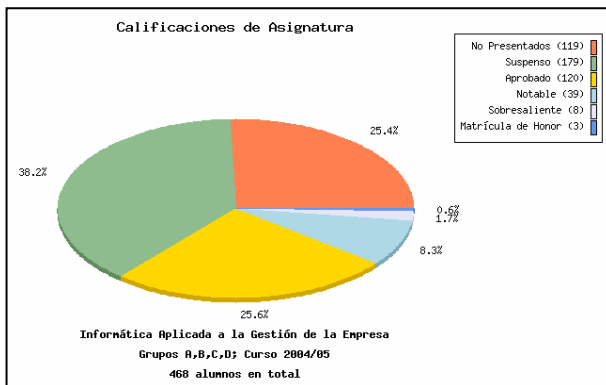


Fig. 2 Pie chart showing (in Spanish) the number (in the legend) and percentage of students (enrolled on a subject, i.e. taken into account all its groups) who have obtained every possible grade, as well as the students who did not the exam.

In this way, the students are able to know their grades and receive contextual information about the grades of their classmates. The system keeps students' data privacy, since only the students themselves and their teachers are capable of consult their marks.

3. Teacher's view: Flexibility and ease of use

Once teachers have been authenticated in the system, they can select an option (from the menu shown in their restricted section) for inserting grades. They have two options: insert them using an external file, or keying them in an electronic form. The first option is specially intended for those teachers who use applications like spreadsheets for organizing and managing the grades. The second one is designed for those who want to key every student's grade. When teachers choose the first option, a screen like the one in Figure 3 is displayed. If they select the second option, then a similar screen is displayed, since it contains nearly the same elements (all of them, except elements 7, 9, 10, 11 and 13). Next, we are going to explain the meaning of every element in Figure 3:

- The first thing to be selected is the subject, the group and the academic year (1) corresponding to the grades to be input, as well as the corresponding examination (2). This last combo box contains all the official examinations, and an option labelled as "Other" that allows the teacher to introduce grades with any description, which must be key in 5 (e.g. "Midterm exam (chapters 1-4)") except if any other teacher of the same subject introduced that description previously. In this case, that description will be in the combo box 4 and the teacher will be able to select it.

- Whenever a teacher inserts the marks of a group, the system automatically generates contextual information (indicating the position of each student) and statistics information (pie charts) for both the group and the students who have been assessed by the same teacher. When a not official examination is selected (option "Other" from combo box 2), checkbox 3 can be activated (default option) or not depending if the teacher wants to generate also this information for the whole subject, i.e. taking into account the results of all the students (belonging to the rest of groups) who have done the same exam or exercise. In the official examinations there is no choice, and the global statistical results (i.e. for the subject) will be always shown, besides those for the group and for the students assessed by the same teacher.

Fig. 3 Screen shot for introducing exam marks by means of a file (in Spanish).

■ Teachers can choose (in combo box 6) the template or style to apply to pie charts. These templates indicate which grades or categories have to be considered for grouping the (numerical) marks. The default style is the one that groups grades in accordance with the categories (grades) shown in Figure 2.

■ Button 7 is used to attach the file containing the marks to be input. It must be an ASCII text file, where each student's data arrange in a line with (at most) four fields separated by a tabulator or a semi-colon (as note 13 indicates): *ID Number*, *Numerical Mark*, *Final Grade* and *Comments*. The last two fields are optional.

■ Teachers can include in 8 (if they wish) the information that they want to communicate to all the students of that group, such as the schedule and place for contesting of the grade.

■ Teachers can choose to ignore the lines of the file without a numerical mark (checkbox 9), which correspond to students who did not the exam, as well as the ones corresponding to students belonging to a different group (checkbox 10). If a teacher wants to input the mark of a student who does not belong to the group selected in 1, this last checkbox must not be activated. It is also possible to show or not a detailed summary about the mark insertion process (checkbox 11). This summary informs the teacher of the number of accepted, input and ignored marks, not only in general terms, but also by groups (if there were students from different groups in the file), as well as the irregularities detected (i.e. students who are not registered in the subject or not registered in the system). Moreover, this last option allows the teachers to access the pie charts that graphically summarize the marks for that group and the whole subject.

■ Finally, by clicking button 12, the marks in the file are inserted (if the option for inserting marks from a file was selected), or a form with students' names of the selected group and three text boxes (*Numerical Mark*, *Final Grade* and *Comments*) to introduce the data corresponding to each of them is displayed. The last two fields are not compulsory.

With all these options the system manages to adapt to the different preferences and necessities of every teacher who use the platform. At the same time, it allows to unify criteria and to present statistics in a homogeneous and intuitive way (by means of graphs). Even more, the platform is simple enough and easy to use.

4. Conclusions

We have presented a communication system of marks that students can consult via web. Its principal advantage is that students can access it whenever they want and wherever they stay. They just need a place with connection to Internet. This avoids them the need to go to the faculty to know their marks.

Moreover, the system respects the privacy of these data, since each registered user (student or teacher) only have access to his/her own marks, by not to his/her peers' ones. Nevertheless, useful contextual information is provided to users by means of statistical and position graphs. This information, which does not violate the other users' data privacy, helps users to adequately value their own results.

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References

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