Implementation of a Learning Card in Moodle

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Abstract

A credit card is the metaphor for the learning card, a device used in 1st cycle courses, as established in our pedagogical model for online learning. Through it, the student accumulates points earned in assessment activities that contribute to the final evaluation in a course.

In this paper we describe the implementation of this device through the adaptation and configuration of Moodle's features. The new grades subsystem in Moodle 1.9 enabled us to configure courses to conform to our model. This gives both teachers and students the feeling of granting and scoring points in a card, as a reward for accomplishing the goals proposed in particular activities, as opposed to globally compute a final grade as a function of its components. Additionally, code changes to the standard assignment module software were necessary, to allow finer-grained grading.

The new groupings feature was also exploited so that we can accommodate in the same space both students in continuous assessment and in final assessment modes.

The end result of this work is a template course that easily allows teachers to start building courses according to the pedagogical model, avoiding complex parameter configuration.

Keywords: pedagogical model, assessment, learning management system

1. Pedagogical Model

Universidade Aberta's (UAb) pedagogical model (Pereira et al., 2007) is based on four principles:

- student-centred learning
- flexibility
- interaction
- digital inclusion

The model has variations according to the study cycle to which it is applied. In the first cycle, since there are many more students than in subsequent cycles, the interaction component is smaller. Discussion forums are opened throughout the course for limited time periods, some of them are moderated by students only, and a few are moderated by the teacher/tutor. All interactive online activities have a merely formative purpose, and are not formally assessed.

In the beginning of each course, students must choose their assessment mode: continuous or final exam. If they choose final exam assessment, their final grade is what they obtain in a final written, face-to-face, exam.

When in continuous assessment, students must produce two or three small digital documents (called e-folios) at specified times, that can be submitted online. They are also subject to a compulsory written, face-to-face, test at the end of the semester, which we call a p-folio.

E-folios, which globally form online assessment, are worth 8 points in total, while the p-folio is worth 12 points. The final grade is the sum of points earned in e-folios and the p-folio. The maximum final grade is thus 20 points, which is consistent with the standard evaluation scale

in Portuguese higher education. Also, according to the Portuguese system, students complete a course when they have 10 points or more.

Additionally, in UAb's system, students must attain minimum values in both online assessment and in the p-folio. If they don't have at least 3.5 points in online assessment and 5.5 points in the p-folio, they cannot complete the course. For instance, if a student has 6 points in online assessment and 5 points in the p-folio (a total of 11 points), she cannot complete the course, since the p-folio grading is below the minimum acceptable.

There is no restriction on the number of e-folios the student must complete, if she obtains at least 3.5 points in online assessment.

2. The learning card

The learning card is a device where students' continuous assessment grades are recorded for each course. It uses the credit card metaphor, whereby students accumulate points throughout the course, earned by completing e-folios and the p-folio. When the card has enough points, and minimum values are achieved in each component (as described in the previous section), the course is completed. The learning card is (for now) a virtual device, that students can access online, and view the total amount of points earned so far in each course. But they can also view the following detailed information:

1. grades and teacher's comments obtained in each e-folio.
2. aggregate grade of the online assessment component.
3. p-folio grade.
4. final grade, when they have completed the course.

Ficha do utilizador - Afonso Henriques

Item Notas	Área	Nota	Percentagem	A suas opiniões
E-fólio A	Avaliação electrónica	1,00	50,00 %	
E-fólio B	Avaliação electrónica	1,00	33,33 %	
E-fólio C	Avaliação electrónica	3,00	100,00 %	
Σ E-fólios	Avaliação electrónica	5,00	62,50 %	
P-fólio	Avaliação Contínua	8,00	66,67 %	
Σ Pontos acumulados	Avaliação Contínua	13,00	65,00 %	
Nota final	Introdução aos Fundamentos	13	65,00 %	

Nome de utilizador: Afonso Henriques. (Sair)

Figure 1 - Learning card

Fig. 1 shows an example of a learning card, as displayed in Moodle. The third column ("Nota" – grade) shows the various component grades, the last one being the final grade.

According to the pedagogical model, item 2 in the list above is the sum of the e-folios' grades. The final grade (item 4) is visible after the course is completed, and is the rounded sum of item 2 and item 3. If, at the end of the semester, students were unable to earn enough points or attain the minimum values for each component, they will see an 'R' for '*reprovado*' (failed), in place of a final grade.

Teachers can also see their students' learning cards, but they cannot credit points directly: instead, teachers grade e-folios and p-folios (activities in Moodle) and the result is transferred automatically to the learning card.

The learning card functionality can be implemented, with minimal adaptations, in the new gradebook of Moodle version 1.9

3. The grade subsystem in Moodle 1.9

Grades can be assigned by teachers to participants in a Moodle course, on activity basis. The set of those grades is organised into a gradebook.

The gradebook has a hierarchical structure, with grade items grouped into categories, which, themselves, can also be grouped into other categories. Fig. 2 shows an example of the structure of a gradebook.

Figure 2 - Structure of a gradebook in Moodle

An aggregated grade is automatically associated to each category, in order to sum up the grades contained in that category. Moodle allows for several aggregation modes: average of grades, sum of grades, highest grade, etc. These modes are distinguished by using different icons next to the aggregate grade items (Σ for sum of grades, $\bar{x}$ for the average). The aggregated grade associated with the highest category (corresponding to the whole course) is the total grade for the course.

Aggregated grades can be customised, by defining a calculation formula that computes the intended aggregation of grades in a category. These formulas are defined in the same way as in popular spreadsheet programs. For instance, if we have three grade items, *a*, *b* and *c*, and

we want the aggregated grade to be the average of the grade in *a* with the best grade in *b* or *c*, we can define the formula:

$$=average([[a]],max([[b]],[[c]]))$$

Grade items can also be created that are not associated with any specific activity in the course. This is useful for special grade components such as a bonus, that is computed as a function of other grade items, but is not a grade category *per se*.

Grades determined in this way are always numeric. Moodle allows them to be displayed with any number of decimal places, but can also be displayed with other symbols. In the Anglo-saxonic system, for instance, grades are displayed with letters A to F.

Gradebook configuration is thus rather complex, and prone to error if you're not careful. As we have seen in the previous section, we follow a pedagogical model that, for first cycle courses, defines scales, maximum grades, calculations and criteria for determining and displaying grades. So, it makes sense to build a template with a fully configured learning card for first cycle teachers to use, sparing them the struggle with gradebook configuration.

4. Building a template for the first cycle

A template course for the first cycle is a regular Moodle course, with all the basic elements and configurations: course plan, e-folios, p-folio, assessment mode choice, groups and groupings for continuous assessment and final exam, and the learning card. By storing a backup of this template course, each teacher (with course creation permissions) can restore it to a new first cycle course, already equipped with the basic devices, and then complete it with contents and activities. Fig. 3 shows the elements that are already included in the template.

Figure 3 - Elements included by default in the template

The course plan is a book resource, already formatted for teachers to fill in their specific contents.

The assessment mode choice is a simple choice activity in Moodle, so that students can choose between continuous assessment and final exam. The template also includes two default groups, for each assessment mode, where students must be placed according to their assessment choice. Since some activities are available only to continuous assessment students, a continuous assessment grouping (a set of groups) is also defined, containing

only the continuous assessment group. This grouping is then associated with any activities that are exclusive to continuous assessment students, namely the e-folios and p-folio (configured to work in separate group mode). Students in the final exam group won't see these activities.

Assignment activities are defined for each e-folio and p-folio. An e-folio is an assignment where students can submit a single file, whereas for the p-folio, as the test is done offline, the corresponding Moodle assignment prevents any kind of online submission. The p-folio assignment must exist, however, since teachers must use it to give grades (and post comments) to students.

The configuration of the learning card in the template involves four major steps:

1. Activity (e-folios and p-folio) configuration
2. Definition of categories
3. Definition of aggregate grades and calculation formulas
4. Mapping of numeric grades to symbols for final grade display

In step 1, e-folios and the p-folio are configured for maximum grade - 12 points in the p-folio and 2 or 3 points in each e-folio. The gradebook is then configured in order to reflect the behaviour of the learning card. Grade items corresponding to e-folios are included in a category called "Online assessment", which needs to be created (step 2) so that an aggregate grade can be associated with it. A category for "Continuous assessment" is also defined, including the p-folio and the "Online assessment" category. The corresponding aggregate grade contains the amount of points accumulated in the learning card.

In step 3, aggregate grades are defined as the sum of all grade items in the category, - as UAb's model establishes – not their average, as Moodle proposes by default. However, the final grade (i.e. the aggregate grade for the whole course) takes into account the proficiency criteria for each component. As we have seen in section 1, if students don't attain minimum results in both online assessment and the p-folio, the final grade is not the sum of all component grades – instead, students must see a simple 'R' (fail). Therefore, we introduced a specific formula to calculate the final grade according to those criteria:

$$=min(max(10*(sum([[efolioA]];[[efolioB]];[[efolioC]])-3.4);0);1) * min(max(10*([[pfolio]]-5.4);0);1) * sum([[efolioA]];[[efolioB]];[[efolioC]];[[pfolio]]))$$

The formula basically computes the sum of all grades, except that if minimum results in both online assessment and the p-folio are not attained, the final grade is zero.

The Moodle version we used doesn't have the "if" operator (as in spreadsheets), so we had to resort to other operators to emulate its functionality. The resulting formula, as we can see, is rather complicated for most users, so it's a good idea that we define it by default in our template.

To display the final grade (step 4), we use the "grade letters" feature, by defining a correspondence table from percentage values[1] to symbols (or letters). Final grades below 47.5% are displayed as 'R' (fail). If the final grade is 47.5% or greater, a corresponding symbol (an integer number ranging from 10 to 20) is displayed.

The new gradebook in Moodle 1.9 is very flexible, allowing us to configure it precisely according to UAb's pedagogical model. Two minor issues, however, had to be dealt with by changing source code and by directly manipulating Moodle's internal database.

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[1] Moodle represents grades internally as percentages.

Both issues were due to the web interface not allowing a finer granularity when inputting values. In the first case, only integer values were allowed when grading an activity. Since some e-folios have a maximum grade of 2, this is very limiting. We thus changed the grading interface, in Moodle's source code, to allow one decimal place.

The other issue was the impossibility to precisely define the correspondence between final numeric grades and the final symbols, also due to the interface only allowing integer values. For instance, we could only define a correspondence between the 'R' letter and the maximum values of 47% or 48%, not the correct value of 47.5%, as we have seen above. In this case, however, we chose not to change the source code, and merely altered the data in the correspondence table in Moodle's internal database. This modification was automatically reflected in the backup of the template course, which was made available to everyone who restored it to their new courses.

5. Conclusions and further work

Moodle, as an open source learning management system, is one of the best and most flexible solutions available for implementing online education. This paper describes the implementation of the learning card, a specific aspect of Universidade Aberta's pedagogical model for first cycle courses, in Moodle.

Most of the features of the learning card can be directly implemented in Moodle, by configuring appropriately its gradebook component. Only two minor issues need modifications to internal Moodle code. Since this code is available through Moodle's open source licence, the small modifications required were very easy to perform.

The goal of producing a template for first cycle courses, available to teachers, was fully achieved. Universidade Aberta has gone through a very rapid change from traditional distance learning to online learning, and most teachers are not familiar enough with virtual learning environments to be comfortable with the configurations and tweakings required by the pedagogical model. The availability of this kind of templates leads to an improvement in teaching quality, because many technical aspects don't need to be addressed by teachers.

Other technical aspects are being addressed in ongoing work, such as the connection of Moodle and the academic information system. This allow us to use Moodle to automatically publish grades into the academic system. Another aspect that we are dealing with is the automatic enrolment of students in courses, according to the information in the academic database. Without automating these tasks, teachers would have to perform them manually.

References

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