Moodle at FEUP

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1   Moodle evolution in FEUP

We started using *Moodle* at FEUP in January 2003 in a personal computer. Other teachers requested some space in that server, and in September of 2004 the service was transferred to a dedicated server maintained by the administration of the School.

Currently, December 2005, 33 courses are hosted in the Moodle@FEUP server, and that number is expected to double when the second semester of the academic year 2005/2006 starts.

2   Courses with Moodle support

Moodle has been very useful in all the courses I have taught during the last year:

Course name	Engineering field	Enrolment
Physics	Civil	339
Electromagnetism	Informatics and Computing	256
Project MAFIQUI	all 9 majors in the School	841
Physics of Dynamical Systems	Informatics and Computing	120

The modules I have used the most are:

- Forums.

- Assignments.

- Quizes (with a custom-made Latex format).

- Exams (custom-made module).

3   Quizes

The quizes we have created are all of the multiple-choice type, with many mathematical equations and graphs.

On-line quizes are used for student's self-assessment, while the quizes that are evaluated are administered off-line, in written form.

3.1   Latex source format for quizes

To produce written quizes with good printing quality, we have used the Latex system, with a custom-made format that can then be transformed into a Moodle-native format (GIFT) with a PHP script that we have created.

As an example, the following Latex code has been used for a question on a mathematics quiz:

```
%%Matemática 12, 2005-11-10
\item Seja $g$ a função real de variável real cujo gráfico se mostra na
figura; designe-se por $\displaystyle L_1 = \lim_{x \rightarrow
+\infty} g(x)$,
```

```
$\displaystyle L_2 = \lim_{x \rightarrow 3^-} g(x)$,
$\displaystyle L_3 = \lim_{x \rightarrow 0^+} g(x)$ e
$\displaystyle L_4 = \lim_{x \rightarrow -\infty} g(x)$ .
\begin{center}
\includegraphics[scale=0.7]{fig-JTB11}
\end{center}
Das seguintes afirmações identifique a correcta:
\begin{answers}
    \item $L_1 = -2$ , $L_2 = 1$ , $L_3 = -\infty$ , $L_4 = -\infty$
    \item $L_1 = -2$ , $L_2 = 1$ , $L_3 = +\infty$ , $L_4 = 0$
    \item $L_1 = +\infty$ , $L_2 = 1$ , $L_3 = +\infty$ , $L_4 = 0$
    \item $L_1 = -2$ , $L_2 = -4$ , $L_3 = -\infty$ , $L_4 = 0$
\end{answers}
%%Resposta: B
```

That Latex code was then converted into GIFT format and imported into Moodle, giving the following result:

15. (1 valor. Máx 1)

Seja g a função real de variável real cujo gráfico se mostra na figura; designe-se por $L_1 = \lim\limits_{x \to +\infty} g(x)$, $L_2 = \lim\limits_{x \to 3} g(x)$, $L_3 = \lim\limits_{x \to 0^+} g(x)$ e $L_4 = \lim\limits_{x \to -\infty} g(x)$.
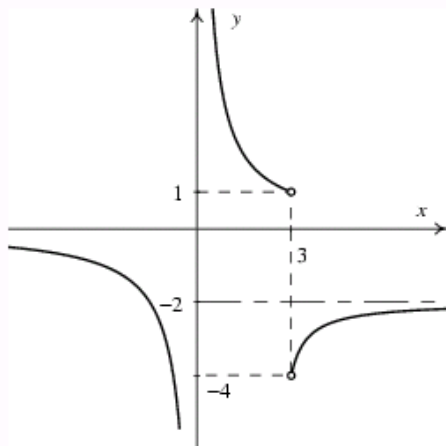
Das seguintes afirmações identifique a correcta:

A $L_1 = -2$, $L_2 = 1$, $L_3 = -\infty$, $L_4 = -\infty$

≫ B $L_1 = -2$, $L_2 = 1$, $L_3 = +\infty$, $L_4 = 0$

C $L_1 = +\infty$, $L_2 = 1$, $L_3 = +\infty$, $L_4 = 0$

D $L_1 = -2$, $L_2 = -4$, $L_3 = -\infty$, $L_4 = 0$

3.2 Postscritpt format for figures

All images used in our quizes are generated from source code files in the PostScript language, invoking a collection of PostScript functions that we have written (**psimage**). For example, the source code for the graph in the figure above is the following:

```
0.6 setlinewidth setaxes
-6 -6 8 6 domain (@x) xlabel (    @y) ylabel
(   3) 3 xmark (1) 1 ymark (-2) -2 ymark
/yflag true def () -4 ymark 0 -6 rmoveto (-4) show
1 setlinewidth
% function 3/x in [-6, -0.5]
[-6 0.05 -0.5 {dup 3 exch div} for] plot
% function 3/x in [0.5, 3]
[0.5 0.05 3 {dup 3 exch div} for] plot
% function -2 - 1/(x-2.5) in [3, 8]
[3 0.05 8 {dup 2.5 sub -1 exch div 2 sub} for] plot
0.5 setlinewidth [0 1 3 1 3 -4 0 -4] 1 dashplot
[0 -2 8 -2] 2 dashplot
0.8 setlinewidth 3 1 openpoint 3 -4 openpoint
showpage
```

3.3 Written versions of the quizes

The Latex and PostScript formats used for the questions, lead to very good quality printed versions of the quizes, as shown in the following figure.

NOME:_____ CÓDIGO:_____

DURAÇÃO: duas horas.

COTAÇÃO: respostas correctas, 1 ponto, erradas, $-1/3$, em branco ou anuladas, 0 pontos.

Cada pergunta tem uma única resposta correcta, se assinalar mais do que uma resposta, a resposta será anulada. Se se enganar e quiser corrigir, pode preencher todos os quadrados nessa pergunta e desenhar um círculo à volta da letra da resposta pretendida.

1. Qual das seguintes equações pode representar a cónica esboçada na figura?
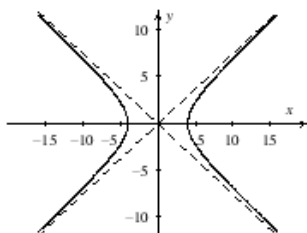
A ☐ $\frac{x^2}{81} - \frac{y^2}{16} = 1$

B ☐ $\frac{x^2}{16} - \frac{y^2}{9} = 1$

C ☐ $(x-2)^2 - (y-2)^2 = 1$

D ☐ $\frac{y^2}{16} - \frac{x^2}{9} = 1$

A ☐ $L_1 = -2$, $L_2 = 1$, $L_3 = -\infty$, $L_4 = -\infty$

B ☐ $L_1 = -2$, $L_2 = 1$, $L_3 = +\infty$, $L_4 = 0$

C ☐ $L_1 = -2$, $L_2 = -4$, $L_3 = -\infty$, $L_4 = 0$

D ☐ $L_1 = +\infty$, $L_2 = 1$, $L_3 = +\infty$, $L_4 = 0$

4. Sabendo que $x \in \left]\pi, \frac{3\pi}{2}\right[$ e que $\cos x = k$, o valor de $\sin x$ é:

A ☐ $-\sqrt{1-k^2}$ **C** ☐ $\sqrt{1+k^2}$

B ☐ $\sqrt{1-k^2}$ **D** ☐ $-\sqrt{k^2+1}$

5. Considere o conjunto

$$U = \left\{ x \in \mathbb{R}\backslash\{-2\} : \frac{x^2 - 2x + 4}{x + 2} \geq 1 \right\}$$

Das seguintes respostas escolha a correcta:

A ☐ $U =]-2, 1] \cup [2, +\infty[$

4 Exams module

As we mentioned earlier, the source code of the quizes is also transformed into GIFT format and imported into Moodle.

We have created a Moodle module, the **exam** module, that helps teachers transfer the student's answers from the written quizes into Moodle. Grades are then computed automatically and students can see their exams and grades through Moodle's web interface.

Student's can thus study their exams carefully, at any time and from any place with web access, without having to set up an appointment with their teachers.

Teachers are shown a grading sheet (see figure below) with links that can be used to see the exam of an individual student or to obtain statistics for the whole group.

5 Automatic evaluation of Scheme Programs

We have also created a Moodle block, called **grade_programs** that the teachers of introductory programming have used to grade student's programs automatically:

Students are asked to write a specific program, during an on-line session with Moodle. They have to submit their programs using an assignment activity in Moodle.

After the on-line session, the **grade_programs** block allows teachers to submit their own program, together with some tests. Each test will be run using the students programs, and the results compared to those obtained using the teacher's program; a grade will be assigned automatically, according to the number of successful tests.

That system has been used at FEUP to teach Scheme programming to first-year engineering students, during the last two years.

6 Project Edukalibre

Edukalibre is a European research project (Socrates/Minerva program) dedicated to the production of free (as in freedom) educational software and documents.

The project consortium is composed by 6 partners:

1. University Rey Juan Carlos, Madrid, Spain.

2. University of Leeds, England.

3. University of Karlsruhe, Germany.

4. UTIA, Prague, Check Republic.

5. University of the Italian-speaking Switzerland, Lugano, Switzerland.

6. FEUP, University of Porto, Portugal.

Our group at FEUP includes one professor, one post-doc, one masters student and four undergraduate students.

6.1 Edukalibre software

The Edukalibre project, which is ending by the end of this month, has produced the following software packages:

Glue Format conversion tools among OpenOffice, Docbook, HTML, Latex and PDF.

Collab Moodle module for collaborative creation of educational documents, with version control. It can also be used independently from Moodle.

Condor Groupware system for Moodle.

Gismo A Graphical Interactive Student Monitoring System for Moodle.

WikiEduka A wiki tool for Moodle, with conversion to Docbook format.

The following screenshot shows the interfaces for Collab, Condor, Gismo and the WikiEduka editor.

7 Conclusions

We have a strong commitment to Moodle in FEUP and we are developing new functionalities for it. We are also developing course materials that can be reused in other Schools.

References

[1] Moodle@FEUP. http://moodle.fe.up.pt

[2] Project Edukalibre. http://www.edukalibre.org

[3] Edukalibre at Leeds University. http://edukalibre.comp.leeds.ac.uk/

[4] GISMO. http://gismo.sourceforge.net/

[5] exam: a module for Moodle. http://quark.fe.up.pt/cgi-bin/viewcvs/moodle/mod/exam/

[6] grade_programs: a block for Moodle.
    http://quark.fe.up.pt/cgi-bin/viewcvs/moodle/blocks/grade_programs/

[7] Psimage. http://quark.fe.up.pt/psimage/