Blended Learning project with Applied Optics. Case study

M.J.P. Maneira, P. Ribeiro and A. Maneira

Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (Portugal)

Project “A Universalidade dos Saberes”
Objective

➢ To show with the case of Applied Optics (AO), the adequacy of blended learning to the teaching/learning process in experimental Science and Technology (S&T).

…and so we must talk about…

1. The traditional teaching/learning process in S&T and with AO
2. Blended learning activities
3. Conclusions and to do…
1. The traditional teaching/learning process in S&T and with AO

### Traditional Process

#### Asynchronous work
- (mainly “paper” supported... but also Internet sites)
  - Announcements
  - Information
  - Notes from the theoretical classes
  - Books
  - Experimental protocols
  - Proposed Problems (lists)

#### Presential work
- Theoretical classes
- Experimental sessions in Laboratory
- Problem solving sessions
  - Assessment
    - Experimental work reports
    - Tests (during the semester)
    - Final examination
    - Tutorial sessions
1. The traditional teaching/learning process in S&T and with AO

**Traditional Process with Applied Optics**

- **Theoretical presential classes**
  - 2 h/week x 14 weeks

- **Experimental sessions in Laboratory**
  - 3 h/week x 8 weeks
  - 7 experimental "projects"

**Assessment**

- 4 Experimental work reports
- 2 Tests (during the semester)
- 1 Final examination

**Content**

1. Introduction to Optics
2. Electromagnetic field and light
3. Propagation
4. Photometry & Radiometry
5. Geometric optics
6. Interference
7. Diffraction
8. Tools

**30 Proposed Problems**

TE 1 – Wave phenomena in tank
TE 2 – Reflection and refraction. Mirrors, dioptra and lenses
TE 3 – Image formation
TE 4 – Laser optical fibers. The Malus Law
TE 5 – Diffraction gratting. Applications
TE 6 – Interference and diffraction. Young’s experiment.
TE 7 – Human eye and vision

1st year, 2nd cycle, (Bologna) for Physics Engineering and Biomedical Engineering
2. Blended learning activities

Learning Management Systems (LMS) used with AO:

- Centra One (2003/04, 2nd Sem)
- Moodle (2004/05, 2nd Sem)
- Blackboard + Horizon Wimba (2005/06, 2nd Sem, 52 students and 2006/07, 2nd Sem, on going)

The project used successively the above LMS and Platforms…

lead to an actual teaching learning process as in the diagram….
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2. Blended learning activities

actual teaching learning process as in the diagram....

Blended Learning

Asynchronous work
(LMS BlackBoard)
- Announcements
- Information
- Learning units
- Experimental Learning Units
- Automatic Tests (quizzes)
  (access to the Laboratories)
- Proposed Problems
- Work reports
  (digital store)

Presential work
- 14 Theoretical classes
- 8 Experimental sessions in Laboratory
- 2 Tests and/or 1 Final Examination

Assessment

Synchronous work
(Horizon Wimba)
- Problem solving sessions
- Tutorial sessions
- Share
  (share applications)
- E-board
  (drawing/writing)
- Web (browsing)
- Audio (till 30 channels)
2. Blended learning activities

The LMS and the tools.....

Blackboard/Horizon Wimba, supplied by Rectorate of the New University of Lisbon.

http://novaelearning.unl.pt
2. Blended learning activities

... areas of the site...

... Announcements...

... Learning units...

... Activities (Quizzes, Live Classrooms...)

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2. Blended learning activities

... the “learning units” can be animated with sound and be used synchronously and asynchronously ...
2. Blended learning activities

... TE - Documents to prepare laboratory works and to be admitted in the laboratory

**TE - Documents to prepare laboratory works.**

One **TE** Document/Experimental activity.
2. Blended learning activities

... **TE** - Documents to prepare laboratory works and to be admitted in the laboratory

**Finalidade (continuação)**

Ao percorrer este documento os estudantes fazem a exploração teórica dos conteúdos programáticos:

- Leis da reflexão e refracção (ligação a **UA3**)
- Desvio mínimo de prisma (Ver **Anexo 1**)
- Desvio lateral em lâmina de faces paralelas, (Ver **Anexo 2**)
- Reflexão interna e ângulo crítico (ligação a **UA4**)
- Focos, focos imagem e objecto (ligação a **UA5**)

Ao percorrer este documento os alunos tomam contacto com os procedimentos a realizar e com imagens dalguns equipamentos e componentes a manipular e respondem a um questionário, credenciando-se para a execução do trabalho em laboratório.
2. Blended learning activities

... TE - Documents with indications to promote prevision of the laboratory components and systems
2. Blended learning activities

...TE annexed documents with extra topics linked to the laboratory activities or specific equipment
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2. Blended learning activities

... 80% in the “TE Quizzes”, to be admitted in the laboratory to perform the experiments...
2. Blended learning activities

...synchronous “Live Classrooms” with Horizon Wimba were used for problem solving and tutorials...

... students in Campus, at home and abroad...

... the tools used...

- Audio “chat” (till 30 channels)
- Share (share applications)
- E-board (drawing/writing)
- Web (browsing)
- Written “Chat”
- Recording “Live Classroom” (for later asynchronous reuse)
2. Blended learning activities

**E-board (synchronously drawing/writing)**

Everybody can talk

Web (browsing)

Everybody can draw and write real time

Teacher’s documents to be used in the “Live Classroom”

“Chat” Area

Connecting to server...
You have connected successfully!
You have entered ‘Aula de Problemas 1’.
Your media format is HorizonMedia Multi-way Audio.
2. Blended learning activities

Sharing problem solutions handling MathCad and talking...

A equação das lentes é: $1/s_0 + 1/s_i = 1/f$

Dados: $s_0 = 0.1m$, $s_i = 4.5m$

Expressões: $f > \left(\frac{1}{s_0} + \frac{1}{s_i}\right)^{-1}$, $P = \frac{1}{f}$

Resultados: $f = 0.098m$, $P = 10.222m^{-1}$

Alinea b): Quais são as dimensões da matriz de pontos luminosos se a imagem no ecrã tiver $1m \times 1.3m$?

Se $M$, fôr o módulo da ampliação ou magnificação, $M = \frac{|s_i|}{|s_0|}$, $M = 45$
Students assessment to the asynchronous process using Blackboard and following “Opinion Scale/Likert”

Some questions:

- The experience is in general positive (89%)
- The instructional materials organization is adequate (83%)
- The adaptation to the platform was easy (83%)
- The platform promotes the interaction with teachers (46%)
- The quality of the contents is satisfactory or better than satisfactory (84%).
- The images and graphic design help the perception and assimilation of concepts and ideas (95%).

57% of the students answered
In general the experience is positive*

### Survey - Opinion poll

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<th>Pergunta 1</th>
<th>Opinion Scale: Likert</th>
<th>Percentage Responded</th>
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<tr>
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<td></td>
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<tr>
<td>Sem Resposta</td>
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<tr>
<td>Sem Resposta</td>
<td>0%</td>
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</table>
Students assessment to the synchronous process when using Horizon Wimba and following “Opinion Scale/Likert”

- The experience is in general positive (100%)
- The adaptation to the platform was easy (79%)
- interaction with teachers is satisfactory or better than satisfactory (86%)
- interaction with other students is satisfactory or better than satisfactory (86%)

Most relevant Comments:

- 20% referred the possibility of working at home and avoiding to come to the Faculty
- Technical Sound hazards were mentioned
3. Conclusions and to do…

Teacher’s assessment (qualitative) to the teaching/learning process when using Blackboard/Horizon Wimba

- The experience is in general positive
- Students prepare better and participate more intensely in experimental and problem solving activities
- Student-student interactions are increased and team work is expanded
- Student-teacher interactions, with less stress and less formality
- Theoretical and experimental topics are deeply explored
- Students appreciate teacher’s work
- Teacher’s want to “go on” developing the process.
- The tools help management of the teaching/learning process
- Monitoring the students work is improved
Some conclusions:

- The experience will “go on”
- E-Learning teams must be established
- The weight of the synchronous component should be increased
- The synchronous component should be further developed
- Teacher’s training must be improved
- Students schedules must take in account the e-learning process
- Use of personal computers must be promoted