Teaching and learning resources based on Problem Based Learning and Life Cycle Assessment

Villeneuve d’Ascq, 08-09 November 2017
Lilliad Learning Center Innovation

Ion-Cosmin GRUESCU, Associate Professor
ion-cosmin.gruescu@univ-lille1.fr
Plan of the presentation

1. Introduction
2. The P2NT – GMP educational project and the pedagogic approach of the Mechanical Engineering department :
   - active learning
   - the use of digital resources
3. The French digital universities UNIT and UVED
   - the 3PM – EFAU project (mechanical manufacturing)
   - the ACV Bat and ECOPem projects (eco design and LCA)
4. Pedagogical and training experiments :
   - the vocational bachelor’s degree in industrial production,
     (speciality "eco-design of innovative products“)
4. Conclusions

Objectives :
✓ the development of an active learning (student based) approach
✓ strengthening the partnership university – professional networks
1. INTRODUCTION

The LILLE 1 University – Sciences and Technology

- founded in 1562 by the Spanish, became French in 1667
- Louis PASTEUR was the first Dean of the Science Faculty in 1854
- State University

Key figures (2014)

- 19,604 students – 21% are international (70 different countries)
- Fields of study:
  - Science and Technology
  - Human and Social Sciences
  - Economics and Management Sciences
- 2,975 staff members (academic and administrative)
- 1,100 Doctorates of which 30% are international
- Research is organised around 5 Institutes and 3 Research Centres
- Lille 1 possesses 5 doctoral schools among Engineering Science
2. The P2NT–GMP educational project

**Background (initial findings and motivation)**

- Traditional lecture course (large body of content / large number of students) is a "one-way transmission of knowledge" efficient presentation which faces superficial learning
  
  ⇒ do not stimulate students motivation (poor) / attitude: limited participation, poor attendance and almost unexisting individual instructor–student interactions efficient presentation

- Course evaluations
  
  - Students were not satisfied; the course was "boring"
  - Lack of recognition for the usefulness of the course content (education, future needs)
  - More concerned with their test scores than with gaining a thorough understanding of the course material

**Proposed solutions**

- Technical platform – new innovative equipments and realisation of user guides and/or technical worksheets allowing to the learner to self-train

- The development of **new digital ressources** and educational kits allowing to other trainers to adapt the proposed ressources with respet to their needs and practices

- The valuation and the capitalization of the acquired experience and of the developed tools: "feedback guide", congresses, symposiums, (Gruescu, 2014 and Gruescu et al., 2014).
2. The P2NT–GMP educational project

- excellent mean favoritizing student succes allowing them to train themselves
  (high and strong level of educational interactivity)
- of expository type (important use of communication tools with the learner – forum, chat, etc)
- a strong presence of exercises, multiple choice questionnaires, case studies / other activities
  centered especially on the Problem Based Apprenticeship (similar to the serious game activities)

⇒ educational grains designed by abording several fields of engineering sciences
  - sequential: the information is detailed in one grain
  - parallel, under the form of worksheets: elements giving the "theoretical" information
    (attached to the methodology) and the practical information (application to the case study)
  - the boxes are opeed by the learner one by one
    (learn, self-evaluate, acquire new knowledge and information)
  - teacher's role / contribution: essentially at the case study level / in the project approach

The target audience

- students of licence level (L1, L2, L3) or master (M1, M2)
- initial, continuing and apprenticeship training
- the trainers themselves (educational kit).
3. The French digital universities UNIT

The 3PM - EFAU project. Manufacturing engineering

Study design and course description

- Scope: evolution of pedagogical contents in the technical sector
- Public: Bachelor's and Master’s degrees
- A two-semester course that typically enrolls around 100 students annually

✓ 4 main parts: theoretical presentations, videos, exercises and multiple choice questionnaires
✓ A new lecture dedicated to the materials used for the machining tools production
✓ Designed to serve as an intellectual bridge between materials science and machining
✓ Work in small groups, each case study – several minutes of discussion (statement of problems)
✓ Additional strategies to create a more student-centered learning environment, every lecture includes a set of learning goals made explicit to students in the lecture PowerPoint slides
✓ The exam are labeled with the corresponding learning goals (alignment with assessment)
✓ As part of the course revision, and based by the use of a moodle platform, we modified the assessment plan to include weekly quizzes

Analyse de fabrication
3. The French thematic digital universities: **UVED**

The ECO PEM and ACV Bat projects. Materials science and Life Cycle Assessment Methodology used in engineering and products design

- **Scope**: evolution of pedagogic contents in the technical sector
- **Public**: Bachelor's and Master’s degrees

**Materials Science and Life Cycle Assessment**

- **ECO PEM**: energy greedy products in household applications
- **ACV Bat**: materials from the building sector

**ECOPEM**

**ACVBAT** and _the radar tool_
4. Pedagogical and training experiments

✓ the Problem–based Learning (PBL) (e.g. Barret and Moore, 2011) is more interesting for students and auditors because it directly deals with real cases
✓ the student is no longer a “listener” but becomes an actor of the methodology, which permits him to acquire knowledge and abilities more quickly and more durably
✓ our method also deals with “organisational learning” given the proposed interactions between the working groups and given the time constraints that each team has to face

The vocational bachelor’s degree in industrial production, speciality "eco-design of innovative products"

✓ dedicated to eco–design students, who are privileged holders of an eco–designed approach, in position to disseminate and implement in practice its innovative concepts and principles
✓ trained to acquire technical, scientific and organisational skills required by companies to implement the eco–design in their practices
✓ 11 modules, totalizing 480 hours of training, spread over two academic semesters and worth 60 ECTS (European Credits Transfer System).
✓ the main outcome of this project is respectively the evolutionary design
5. Conclusion

✓ Lille 1 – Mech. Eng. Department developed a pedagogy focused on incorporating active-learning and student-centered pedagogy in courses

- the creation of a technological platform (innovative technical equipments)
- the reorganisation of existing courses / introduction of new ones

✓ changing the instructional design of a course, without wholesale changes to course content ⇒ good feedback, more positive results in students evaluation (improved attitude and/or performance)

✓ the use of the PBL methodology – permits to train students, auditors, or designers:

  ⇒ better results (appropriation of the subject) than those which could have been obtained using conventional pedagogical methods
  ⇒ lead to creativity, innovation, or scientific results.
5. Conclusion

✓ active learning – key aspect of the education, can be applied to any learning environment (online to standard lectures or as a blend of these)

✓ the approach has been applied to mechanical manufacturing, eco-design and Life Cycle Assessment courses but it is clear that the application field is not at all limited

✓ the course reorganization provides not only a model for revision of an individual course but can also be a catalyst for institutional reforms.

✓ the force of the project lies not only in the interest of the aborded themes but equally in its regional* and national recognition

Thank You!

* Special thanks to the Nord-Pas de Calais Region and AvniR platform for the promotion of the digital resources in the ECOPEM+ project
References


✓ Huba, M.E & Freed J.E. *Learner-Centered Assessment on College Campuses. Shifting the Focus from Teaching to Learning*. Boston: Allyn and Bacon.
