

El1 B2 Introducción a la Ingeniería II

Héctor Augusto A



fcfm

FACULTAD DE CIENCIAS
FÍSICAS Y MATEMÁTICAS
UNIVERSIDAD DE CHILE

El1B2- Introducción a la Ingeniería II

¿Qué tiene que ser capaz de hacer un Ingeniero?



Concebir
Diseñar
Implementar
Operar

<http://www.cdio.org>



Concebir

- Definir requerimientos y metas del sistema
- Definir funciones, conceptos y arquitectura del sistema
- Desarrollar modelos del sistema que permitan su evaluación
- Desarrollar la planificación del proyecto



Diseñar

- Llegar a solución “acabada” y “factible” del problema
- Definir en detalle esta solución
- Evaluar alternativas
- Visualizar y resolver problemas de implementación.



Implementar

- Diseñar el proceso de implementación
- Concebir el proceso de fabricación de Equipos
- Concebir el proceso de Implementación de Software
- Diseñar la implementación e integración de los procesos
- Probar, Verificar, Validar y Certificar
- Gestión de la implementación



Operar

- Diseñar y optimizar operaciones
- Entrenamiento y capacitación de las operaciones
- Soporte durante el ciclo de vida del sistema
- Reconocer la evolución y mejoramiento del sistema
- Manejo de fin de vida útil y desechos
- Gestión de operaciones



Afiches (Posters)

- Muy usados en congresos y seminarios
- Entregar información sin que el observador deba esforzarse
- Debe capturar el interés y atención
- Debe ser fácil de leer y entender



Afiches (Posters)

- Títulos
- Diagramas
- Tablas
- Diagramas de flujo
- Ejemplos táctiles
(materiales, partes, etc.)
- Caricaturas
- Fotografías
- Gráficos
- Ilustraciones
- Esquemas



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Afiches (Posters)

- Tamaño recomendado:
60x90 cms (24"x36")
- Letra al menos 18 pts, contraste con fondo
- Dar sentido a flujo de información
- Aplicar síntesis
- Incluir: miembros del grupo, fecha.



Afiches (Posters)

- Poner atención en presentación (limpieza, orden)
- Deben hablar por si mismos



Posters Sessions





UNIVERSIDADE DE CAXIAS DO SUL
CCET - CENTRO DE CIÊNCIAS EXATAS E TECNOLOGIAS
DEPARTAMENTO DE FÍSICA E QUÍMICA

A FOOD ENGINEERING INTERDISCIPLINARY, INTERACTIVE AND VERY ACTIVE COURSE: TECHNOLOGY OF CEREALS AND BAKING - A COURSE WHERE STUDENTS COOK COLLABORATIVELY WITH THE SENSES

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Abstract: An elective course called "Technology of Cereals and Baking" (TCB) from the Food Engineering program of the Universidade de Caxias do Sul (UCS) has an interdisciplinary, innovative and experimental approach totally based on the active learning methodology with a strong inclination toward hands-on activities and team work. The methodologies used in the TCB course allow the development of competencies and abilities for solving new problems, for communicating ideas, for making decisions, for having initiative, creativity and intellectual autonomy, in a context of respect for the rules of democratic society.

Introduction:

In this work presents an elective course called "Technology of Cereals and Baking" (TCB) from the Food Engineering program at the Universidade de Caxias do Sul where an alternative to the traditional paradigm is developed, investing in the holistic vision, by which the academic study is carried out analyzing the whole context, in contrast with the fragmentary approach of much present pedagogical work developed at the majority of universities.

The TCB course has an interactive and experimental approach totally based on the active learning methodology with a strong inclination toward hands-on activities and team work.

The first part of the activities is designed in a way that the students are going to make mistakes in terms of: measuring the quantities, manipulating equipment and raw material, etc. In the second part, students work with recipes on an industrial scale. Some recipes have the objective of recovering the history of the region where UCS is located. At the end of the semester the students participate of a contest where they need to use all the skills and competencies developed during the semester to develop a recipe that they are not familiar with.

The results are great and the conclusion is that success in this kind of hands-on teaching-learning approach is mainly due to group work and collaborative effort that also help developing students' social skills and critical thinking.

"Technology of Cereals And Baking" Course (TCB)

The general objective of this course is to present to the future food engineers the theoretical and practical understanding of the processes of grinding cereals, mills and tubers for starches and flours, as well as the main technological processes and equipment used for the manufacture of products like: breads, cakes, biscuits, pastry and pasta from a more interdisciplinary point of view.

Cooking collaboratively with the senses at TCB

Within the spirit of the TCB course and of an interdisciplinary proposal, activities related to the senses were adapted and are conducted throughout the entire course helping develop abilities and competencies of the food engineering students.



Figure 1 - Activities involving the senses of taste and smell

Learning about the raw material used at TCB

Before initiating any procedure for the manufacture of baking products, it is necessary to know more about their characteristics. The quality of the raw material is basic for the success of the final products.

Therefore, the students carry out different tests with the objective of verifying if the raw materials that will be used are adequate for the production.



Figure 2 - Students working at a very active TCB activity

A Challenging Task - Learning about the baking processes

In the very beginning of the course, there is also a challenge to the students that consists in a program of weekly production for a bakery: 500 French rolls weighing 50g each, 200 hot dog rolls weighing 100g each, 100 hamburger rolls weighing 100g each, 50 sweet rolls weighing 100g each, and 100 sweet rolls called "dreams" weighing 80g each.



Figure 3 - Some of the breads and pastry prepared by the students

Specific Operational Activities

Some specific operational activities are also proposed, such as: (i) the preparation of different types of breads, sweet breads, "dreams" (a Brazilian specialty), "cucos" (another Brazilian specialty of German origin) and croissants; (ii) the preparation of different types of pastry dough and (iii) the preparation of different types of pasta. Some recipes have the objective of recovering the history of the region where UCS is located.



Figure 4 - (a) The preparation of French rolls. (b) Students verifying the consequences of the procedures.

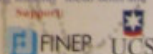
FINAL REMARKS

Throughout the development of the TCB course we have attempted to construct a bridge between the university and the workplace of the food engineer, through the joint diagnosis of problems and the elaboration and evaluation of an educational proposal that must be adapted and have its validity tested in different educational contexts.

Our proposal is to stimulate the use of the initiative, creativity, involvement and responsibility. The students acquire a significant amount of new knowledge that is acquired rapidly due to the ludic nature of the activities.

The methodology used in the TCB course allows the development of competencies and abilities for solving new problems, for communicating ideas, for making decisions, for having initiative, creativity and intellectual autonomy, in a context of respect for the rules of democratic society.

The results obtained in this course are very satisfying and the conclusion is that success in this kind of hands-on teaching-learning approach is mainly due to group work and collaborative effort that also help developing students' social skills and critical thinking.



PBL AND SERIOUS GAMES

Julian ALVAREZ - alvarez@irit.fr - Vortex Team and LARA Team



Mots clés : Active learning, PBL, Serious Game, Similarity, Video game

OBJECTIVE

The aim is to show similarities between the active learning approach PBL and Serious Games.

Our approach is a pedagogic experience led during one month in the shape of a PBL which subject was to create a Serious Game.

The goal of this work is to study the object Serious Game in order to merge it with PBL by combining their added values

WHAT IS A SERIOUS GAME?

The vocation of a Serious Game is to invite the user to interact with a data-processing application whose intention is to combine at the same time teaching, training, communication, or information aspects, with ludic mechanisms based on video game. The purpose of such an association is thus to give attractive shapes or plots (Game) to didactic contents (Serious).

SERIOUS GAME PROJECT :

- Six groups of 5 students according to their affinities.
- 1 month to realise Specification, Paste-up of multimedia, Questionnaires, Journal and Presentation
- The students have shown a fine involvement in realizing the project

RESULTS

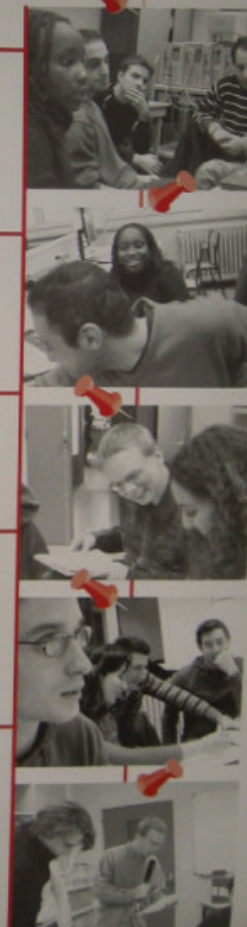
We have found 6 similarities, not exhaustive, between the PBL and the Serious Games. These common points concern as well their pedagogical approach as their questions.

All this will allow us to conclude that it is possible to study the crossed recursivity of these two approaches in order to understand them better and eventually optimize their relationship.

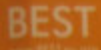
LIST OF SIMILARITIES BETWEEN THE PBL AND THE SERIOUS GAMES:

- The iterative approach
- The presence of the ludic aspect
- The presence of a mediator
- Have to prove to a great number of persons their added values
- Have to find adapted systems of valuations
- Have to give an answer to a generation with an eagerness of interactivity

This is not exhaustive







Time 4

Active Learning in Education!

Project Based Learning

Outcomes from "BEST Events on Education" that took place in Aalborg, Denmark, in the period 21 - 28 August 2005 with the subject "Teaching methods of the future: E-learning and project based Learning"


Teacher's role

- Giving feedback
- Provide with source of information
- Be a mentor of the group
- Evaluate final results

Group working student's role

- Set priorities and deadlines
- Divide tasks
- Follow up and resolve conflicts

Knowledge that students receive from Projects tests and trends longer since practice is always easier to remember.



Thematic Networks

Activity of BEST is THREE

SIG 86
 Developing
 Integrative
 Relations

SIG 88
 The Role
 of Extracurricular
 Activities

Projects with EuroPACE

1. **SPURITE** - Students Promoting the Use of Technology for Networking and Educational Collaboration
2. **SW-BASE** - Social Mobility Before and After Student Exchange
3. **REAP** - Real virtual projects (distributed projects)

Events on Education


BEST Events on Education (BEEs) are BEST events where students discuss, gather and distribute knowledge on specific themes of concern for engineering students in the field of education.

Students in the field of education, **BEST Symposium on Education** (two types of such events: **BEST Symposium on Education** and **BEST Academic and Companies Forum (BACoF)**) through ITS Educational Programme, BEST is aimed to facilitate discussions in educational matters and transfer the results to other interested parties. BEST is therefore supporting European and BACoF with the participation of the main stakeholders in education.

Events on Education increase the awareness of engineering students on educational issues by expressing their views, sharing their experiences, and above all, with their natural commitment to the academic and the industrial world, professors and company representatives.

It should be noted however, that BEST is a very good platform for students to express their views and share their experiences, but it does not produce practical improvements, such as the results of the research for which the research is only able to the process of change in European engineering education, and places them to with their opinions and ideas there.

Applications to Events on Education



Year	Applications
2000	100
2001	150
2002	200
2003	300
2004	400
2005	500

For more information please visit the official website of Board of European Students of Technology:

www.BEST.eu.org

Prepare the

the child

by Montse Farreras

Discussion and reflection

Out-of-class activity through the use of a forum. Teacher opens discussion generating new questions based on the identified unclear concepts from the individual assignments. Students may post comments or other questions any time.

One-minute paper

On the last five minutes of class, students are asked to nominate The three most important and the three most confusing points in the lecture just concluded. Teacher processes the answers and acts on the feedback.

Working in pairs

A question or exercise is raised during a lecture. Students are asked to work either in a think-pair-share or pair problem-solving manner. After the scheduled time, some pairs show the solution.

Reading exercise

A short reading acting as a stage-setting exercise before the lecture starts. A thought provoking questionnaire could also be used.

Group problem solving competition

A cooperative learning activity that takes place in & out of class. Students organize themselves into teams of two to four. Each team is responsible for a subset of problems, that they will present in class. A team gets points by presenting correct solutions and by correcting other teams' answers. At the end teams are ranked and the top three are rewarded.

Jigsaw

Expert teams are formed to answer... that guides them through the main points of a topic, with each team member taking responsibility for one aspect. Expert teams, students responsible for the same aspect, are formed and go over the material. After adequate time, students go back to home teams and bring their expertise.

Anonymity encourages us to participate.

Important concepts are clarified.

Questions are previously meditated.

Not everybody participates.

Discussions delay the final answer.

We appreciate going over the muddiest points.

We remain anonymous.

Teacher adapts to the audience.

We are pushed to think about the problem instead of waiting for the answer.

We increase attention to the lecture.

The problem comes when none of us know the answer time.

Shy students don't feel comfortable and may lose.

After the reading the lecture is more fulfilling with a lot of interaction.

It is very difficult to concentrate.

It is time consuming. We could read at home.

We are motivated while we help each other to learn.

It is time consuming.

We have too much homework.

We go through less problems because we comment on every solution.

It is time consuming.

The explanations from our peer are not quite clear.

We do not feel confident.

Misunderstanding of important is.


Shy students don't feel comfortable.

Active learning methods require more time and effort than classical lecture approaches.

Effort and knowledge are directly related. That is why motivated students benefit from Active Learning, also they gain autonomy.

But this time investment is not worth if students are not motivated since they will not spend enough time in the individual assignments and learning may fall short.

Activities should be chosen with care, promoting those oriented to gain knowledge more than those oriented to improve social skills.





Interdisciplinary practices

mixing **mathematics** with **electronic circuits theory**

maths

circuits

WHY?

BECAUSE NEW ACTIVE METHODOLOGIES FORCE US TO REDUCE THEORETICAL HOURS

GOALS in groups

- DESIGN A PROGRAM TO DO FOURIER SERIES
- REPRESENT VISUAL FOURIER SERIES
- ANALISE VISUAL HARMONICS
- ANALISE TOTAL HARMONIC DISTORTION OF SIGNALS
- CALCULATE ENERGY

HOW?

COMPARING THE SYLLABUS OF THE TWO SUBJECTS

SUBJECT	CONTENT			
mathematics	calculus of multiple variables	Fourier series	multiple integrals	differential equations
circuits	circuits analysis time domain	circuits analysis frequency domain	filter	

RESULTS

- STUDENTS RELATE MATHS AND CIRCUITS
- STUDENTS ANALISE THE SIGNAL
- STUDENTS VALIDATE THE RESULTS OBTAINED BY HAND
- SYNERGY BETWEEN THESE TWO SUBJECTS → EFFICIENCY OF TIME
- STUDENTS LEARN TO USE A GENERAL PURPOSE MATHEMATICAL ANALYSIS PROGRAM

REDESIGNING DRAWING COURSES FOR ENGINEERS

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How can I say it ?

This is a metallic object with a long cylindrical body (between 20 mm and 150 mm). Its diameter is between 1 mm and 5 mm. On one end of the body there is a flat round disk as a head, while on the opposite end there is a pointed tip.

Conception

Object

Technical Specification

Functional Objects Design

Assembly

Spare Parts Manufacturing

Design for Assembly

Assembling the parts into a functional object.

