PROJECT PROPOSALS DEVELOPMENT – ENTREPRENEURSHIP AND REFLECTION IN TEACHING INFORMATION TECHNOLOGY

Ivan Shotlekov, Penka Taneva-Kafelova

Abstract. *This work presents a model for development of project proposals by students as an approach to teaching information technology while promoting entrepreneurship and reflection. In teams of 3 to 5 participants, students elaborate a project proposal on a topic they have negotiated with each other and with the teacher. The project domain is related to the practical application of state-of-the-art information technology in areas of substantial public interest or of immediate interest to the participants. This gives them ample opportunities for reflection not only on technical but also on social, economic, environmental and other dimensions of information technology. This approach has long been used with students of different years and programs of study at the Faculty of Mathematics and Informatics, Plovdiv University "Paisiy Hilendarski". It has been found to develop all eight key competences for lifelong learning set forth in the Reference Framework and procedural skills required in real life.*

Keywords: project-based learning, reflection, entrepreneurship, key competences, lifelong learning, teaching IT

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1. Introduction

What do a major in Computer Science, a major in History and Literature, and two majors in Economics have in common? Well, they made a perfect match between innovation and entrepreneurship and co-founded a social communication utility that sprang to life from the university student communities to become today's largest social network with over 500 billion active users. In fact, the world's youngest billionaire - Mark Zuckerberg, started Facebook's predecessor Facemash when he was just a 19-year old sophomore at Harvard. What were the teaching and learning processes, the family, academic and social environments underlying the competences the young men had to make it happen? Or was it the right balance between these? In this work we will focus only on the role of university education and how it can improve an individual's life-long performance.

Until 20 years ago, entrepreneurship programs were offered almost exclusively only to students in business schools, but "this started to change in the 1990s when educators realized that students in science, engineering and other disciplines had to have entrepreneurship and leadership skills to succeed in a rapidly changing world." [1]. The European Commission conducted a project

called “Entrepreneurship in Higher Education, Especially in Non-business Studies” in the period 2001-2005. The final report of the expert group concluded that “if it is to make a success of the Lisbon strategy for growth and employment, Europe needs to stimulate the entrepreneurial mindsets of young people... The important role of education in promoting more entrepreneurial attitudes and behaviours is now widely recognised…” [2, p. 7]. Centers of Excellence in Entrepreneurship are an indispensable part of universities in USA and Canada and Entrepreneurship courses and project development courses are already part of the curriculum. However, entrepreneurship in non-business studies is quite a new issue in a number of countries. And while integrating entrepreneurship as an important part of the curriculum involves policy making at national and institutional level, a step in this direction can always be made at the discretion of faculty members. “In the field of education we usually align departmental priorities with the broader institutional measures of success. Being entrepreneurial, however, is about shifting our perspective. Thus, through changing and improving our departmental beliefs, attitudes and values, we can try to make the institutional measures of success align with us.” [3, 80]

In our teaching experience, project proposals development is not only a reflexive approach to teaching information technology, but also promotes students’ entrepreneurship, creativity and motivation. This approach fosters all eight key competences for lifelong learning as set out in the Reference Framework [4]: 1) Communication in the mother tongue; 2) Communication in foreign languages; 3) Mathematical competence and basic competences in science and technology; 4) Digital competence; 5) Learning to learn; 6) Social and civic competences; 7) Sense of initiative and entrepreneurship; and 8) Cultural awareness and expression.

This paper presents project proposals development as a teaching and learning technique promoting entrepreneurship and reflection in teaching Information Technology based on the authors’ long experience with students from the Bachelor’s and Master’s programs in the Faculty of Mathematics and Informatics (FMI) at Plovdiv University “Paisiy Hilendarski”. A practical approach is applied allowing the teacher-friendly dissemination and adaptation in compliance with the relevant contexts that do not need to be confined to ours: English for Information Technology classes. Examples provided throughout this paper are meant to be authentic and not models to follow. The term “reflection” used throughout this paper refers to “those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations” [5, p. 19].

2. Materials and methods

FMI’s multimedia computer rooms were used during the contact classes for standalone and web-based activities. Students were encouraged to carry on with communication within teams beyond the classroom walls either from campus, or from home, or other informal settings using portable and mobile information and communication technologies.

Team building and project domains. As a first step, students were introduced to the activity. They were supposed to work in teams of 3 to 5 members to develop project proposals on a topic they negotiated with each other and with the teacher and hold mock versions of various events, such as presenting their projects, meetings with donors, etc. Through the years we have applied two approaches to the warm-up phase: a team-oriented one and a topic-oriented one. In the first case, the teams were formed before the domains were negotiated, while under the second scenario we proceeded the other way round. In the team-oriented approach we first invited students to reflect on their strengths, weaknesses, opportunities and threats from the perspective of the forthcoming activity they were going to take part in. Under the topic-oriented approach, we applied the brainstorming technique in order to identify prospective project domains, e.g. IT for environment, IT in education, etc. In either option we facilitated the process to help students stay focused on project domains related to the practical application of state-of-the-art information technology in areas of vital public interest, e.g. environment, or in areas of immediate interest to the participants, such as improving the quality of teaching and learning at their university. The concepts of project and project application form were introduced eliciting sharing of student's experience. For a project, we adopted the definition given by the Project Management Institute's Guide to the Project Management Body of Knowledge, "Project – a temporary endeavor undertaken to create a unique product, service or result." [6, p. 464]". Students agreed to refer to PM Dictionary [7] for other project management terms and to online project management resources, e.g. those developed by MindTools [8] or by D. W. Farthing [9] to name a few. Many useful insights also came from [10]. Use of dedicated software was encouraged and an awareness-raising comparison [11] was presented. Students were facilitated with templates produced by the authors, but were free to modify them as necessary. The project application form used at FMI in the 2009-2010 academic year contained the following elements:

Project idea. Students were invited to state the idea behind their team's project in a nutshell, *e.g. The project is meant to enhance FMI students' awareness of academic activities at their department and university.*

Project title (provisional). Team leaders organized their teams in brainstorming activities to arrive at a shared idea for a project title, e.g. ONS: *Online Notification Service for FMI students of Informatics*. The final formulation of the project title came later to incorporate the main objectives of the project and to "sell" the project to both donors and stakeholders.

Project period. Each team defined the beginning and ending dates of their projects, *e.g. 01 Feb 2010 – 31 Mar 2010.*

Project target group. Project beneficiaries were identified and listed, *e.g. students at FMI, University of Plovdiv administration.*

Project stakeholders. Teams made lists of those who they thought would be concerned by their project in a positive or negative way and why, *e.g. FMI Students → Receive information updates on key curricular and extracurricular*

events going on at FMI and Plovdiv University. Faster performing teams or Master-degree students may also consider how they will be concerned and involved, or even produce influence maps.

Project background. Describe the current situation, identify existing problems and explain how your project will solve these problems. *e.g.*

Nowadays FMI students lead very busy lives… This makes their time harder to manage, which usually leads to omitting many events within and beyond the university. So, our idea is to create an efficient notification system for FMI students which will eventually replace the current (passive) way of notification for current events. In order that students at FMI be well informed about all current events in their faculty and university, they always have to check the website or the message board with thumb-tacked notifications, which is pretty inefficient. So the idea is to create an "active" notification system which will take care of the updates on current events and notify the students via SMS or e-mail, whatever they prefer.

Project Aim(s). **Why** did you decide to launch this project, *e.g.*

To enhance FMI students' awareness of current social, academic, IT & scientific events within and beyond Plovdiv University.

Project Objectives (They should be SMART - Specific, Measurable, Attainable, Relevant, and Timed).

How are you going to implement the aim(s) above, *e.g.*

- *Set up a web infrastructure with intuitive interface for both students and operators*
- *Create a database with user accounts for each student*
- *Arrange content development by a team of students and teachers*
- *Provide training to inexperienced contributors*

Project outputs and milestones. What are the deliverables you plan to produce and by when, *e.g.*

Web-based database of current and forthcoming events (by Feb 8, 2010)

Project overall impact. What is the overall impact do you expect your project to have, *e.g.*

Higher attendance of extra-curricular events & guest lectures

Project quality indicators. What are the requirements for success of this project and how can performance be assessed for compliance. In other words, how can you show your project is successful?

30% increase in attendance of extra-curricular events by the end of March 2010

Monitoring and evaluation. Make a list of the monitoring and evaluation activities you plan to undertake, *e.g.*

Conduct regular feedback surveys

Project inputs. Main headings are provided at this point, e.g.

team members time, external experts' fees, IT equipment, rent fees, etc.

Project funding sources

FMI – will provide hosting, etc. + awards (computer mice & pads); EU funds will be sought (… programme), etc.

Risk analysis. Identify key potential risks, analyze their impact and plan responses to reduce (mitigate) adverse impact. Faster performing teams or Master-degree students may also be invited to produce risk impact/probability charts. *e.g. Server develops hardware problems → The whole information in the database is lost → Keep backup copies.*

APPENDICES:

A. Work breakdown structure (WBS).

B. Schedule (data).

C. Schedule (diagram, e.g. Gantt chart)

D. Budget.

E. Responsibility matrix. – project proposal team management tool

F. List of prospective donors.

G. Letter of invitation to the donors.

H. Team leader's report.

J. Presentation. (file created in PowerPoint or other software)

Mock donors meeting is usually held during the last sessions in class. This is a role play in which project proposal teams act as presenters, while their peers take on the roles of donors and stakeholders.

The project application form used in the classroom has more or less all the elements real-life project application forms usually have, since they differ from project to project depending on the donor organization's requirements and the project's nature. Developing a project proposal using this template makes our students better suited for the high requirements of the labour market, thus highly competitive.

3. Results and discussion

The project application form components are not supposed to be completed in the sequence in which they are listed above – some of them can be done in parallel. They have been found to promote all key competences for lifelong learning, as indicated in Table 1.

As we have noted on another occasion, a 21st century teacher should also be a project manager. Should that not be the case yet, we would recommend self-learning where the local academic authorities do not offer professional development programs.

Key competences for lifelong learning (European Parliament and Council)	**Project Proposal Development approach**
communication in the mother tongue **"**the ability to express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form…, and to interact	Even on English for IT courses, students communicate in their mother tongue, especially during their communication within or across teams outside the classroom. In addition, during their desktop research, they access and process a large

linguistically in an appropriate and creative way in a full range of societal and cultural contexts;"	amount of documentation and other resources in Bulgarian.
communication in foreign languages cf. above, plus "mediation and intercultural understanding."	Communication in English as the target language, was a major aim on this course, especially during the contact sessions. Moreover, students in command of other languages accessed relevant materials in those languages.
mathematical competence and basic competences in science and technology. "ability to develop and apply mathematical thinking in order to solve a range of problems in everyday situations… mastery, use and application of knowledge and methodologies which explain the natural world;"	Students reinforced and further developed their existing knowledge, skills and attitudes in math and science which was required by the very nature of the projects and the related content knowledge involved, as well as algorithmic thinking in performing the development of the project proposals.
digital competence "the confident and critical use of information society technology (IST) and thus basic skills in information and communication technology (ICT);"	IT was another major aim of the English for IT courses. It was both a tool for implementation of the target projects, and the means to develop the project proposals and present them.
learning to learn "the ability to pursue and organize one's own learning, either individually or in groups, in accordance with one's own needs, and awareness of methods and opportunities;"	Teamwork was largely organized by team leaders and team members themselves who pursued methods they found efficient, assisted by reflection on experience gained and input from the teacher when required or needed.
social and civic competences. "personal, interpersonal and intercultural competence… Civic competence, and particularly knowledge of social and political concepts and structures…;"	Team building and teamwork teach the students some crucial skills such as those covered in the PMBOK Guide: leadership, team building, motivation, communication, influencing, decision making, negotiation, etc.
sense of initiative and entrepreneurship "the ability to turn ideas into action. It involves creativity, innovation and risk-taking, as well as the	Students are empowered throughout the activity: from identifying the project idea to the elaboration of the project proposal and their presentation. They more often than not invented new solutions to existing problems

ability to plan and manage projects in order to achieve objectives;"	rather than adapt existing ones.
cultural awareness and expression "involves appreciation of the importance of the creative expression of ideas, experiences and emotions in a range of media (music, performing arts, literature, and the visual arts)."	Teams meticulously designed their mock invitations to prospective donors and multimedia presentations. For some of the students, the project proposal development became a mission that they put their minds and hearts into what they produced, especially in the discussions and Q&A sessions.

Table 1. Eight key competences for lifelong learning and project proposal development

The mock donors meetings provide students with insights into other teams' projects. They are of great help to developers, too, and offer opportunities for reflection not only on technical but also on social, economic, environmental and other dimensions of information technology.

4. Conclusion

In this work we presented a layout we have been improving over many years of experience with FMI students in English for IT classes. We have found this approach to boost IT learning while building entrepreneurship competences by fostering critical thinking, problem identification, problem solving, creativity, and initiative to name a few. This approach allows promoting all eight key competences as set out in the Reference Framework. If your higher institution does not have a strategy for promoting entrepreneurship, faculty members can start bottom-up initiatives by making small steps as the one suggested in this article, thus setting an example to be followed, and gradually changing the learning environment and methods towards innovative ones. In the form presented here, teaching through project development is ready to be adopted or adapted by prospective multipliers as suitable for their own aims and contexts. Our plans for future developments include online facilities for inexperienced teachers who wish to implement this method.

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Ivan Shotlekov,
Faculty of Mathematics and Informatics
University of Plovdiv
236 Bulgaria Blvd.
4003 Plovdiv, Bulgaria
www.shotlekov.net/fmi,
e-mail: ivan@shotlekov.net

Penka Tanneva-Kafelova,
PLOVDIV Entrepreneurship Centre
at Technical University of Sofia Plovdiv Branch,
25, Tsanko Dyustabanov Str.,
Plovdiv 4000,
e-mail: tanneva@gmail.com