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On blended collaborative learning, a case study: A project on raising awareness regarding GMOs

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Abstract

This paper investigates the use of web 2.0 and mobile technologies in the development of a collaborative project assigned to a mixed group of students in Biology, Communication Sciences, and Economics. Experiment Design. The project aims to provide two materials to be used in raising awareness on the genetically modified organisms (GMOs), as an application related to the discipline “Vegetal biotechnology”. Two teams, comprised mainly of students in the third year of study in Biology, have been completed with colleagues who provided skills in information management and economic issues. The teams worked during and between two face-to-face sessions, having the full scope to choose the tools, the content, and the format of the output materials. Findings and Results. The deliverables of the students brought together accurate information in various formats, in frameworks with high potential to impact the perceiver. The experiment created the environment which allowed us to observe the skills that students prove with respect to the use of mobile devices and web 2.0 technologies. Conclusions. The considered case proved once more that these tools may be involved in everyday educational process, making it flexible and challenging.

Keywords: Blended learning, collaborative learning, web 2.0, mobile devices, genetically modified organisms;

1. Introduction

The present research fits into the framework of innovation in teaching Biology with ICT technologies, in the context of Higher Education. The experiment we describe investigates the use of web 2.0 and mobile technologies in the development of a collaborative project which aimed to raise awareness on the use of GMOs.

Why such a project?

It is well known that among the priorities that the European Commission marked out, within the last Framework Programme for 2007-2013, sciences received a central place. Young people have to be shown the fundamental role of science for the development of the society and for its well being, as their perception on science is often distorted (Christidou, 2011). Teaching science needs to be renewed, in order to adapt it to the new generation. Therefore, the use of new learning and teaching methods has the aim to raise the interest and motivation of the students for science. Attempts have been done to link learning styles theories with the classroom, to enhance results in science (Tanner & Allen, 2004). As well, approaches infusing social context in science teaching are important because they prepare
students for the problems of our century, which are highly interdisciplinary. An extended report on this topic, with special focus on Biology, can be found in (Vohra, 2012).

Biology is about how and why we do exist, so biology definitely deserves our attention on how to teach it. Within this large area of science, biotechnologies - with their numerous application fields such as medicine, nutrition, farming - comprise ethical issues and, therefore, specific problems when treading this delicate subject with students (Harms, 2002). For example, the debate on genetically modified organisms (GMOs) is not new (Hails, 2000), but does not seem to come to a conclusion. The overall benefits or risks to society are still under research.

In line with our permanent attempt to innovate the teaching and learning processes and addressing the implications that the use of GMOs has in our society, we developed an experiment for a mixed group of students in Biology, Communication Sciences, and Economics. We asked them to realize a synthesis on this topic and to express their opinion.

2. Research setting

“Vasile Alecsandri” University of Bacău (Romania), where the experiment has been put in scene, offers education in: humanities, engineering, fundamental, social and life sciences. All study tracks include cross-disciplinary courses, aiming to develop skills and attitudes that allow students to use their knowledge as responsible specialists and citizens, after graduation.

2.1. Purpose of the study

The project challenged the students to deliver two materials to be used in raising awareness on genetically modified organisms (GMOs). This undertaking was the framework where we could investigate the following: their cognitive and metacognitive competencies (within their specialization and related areas), communication competencies and the nature of the relationships within the work groups, evaluation (and self-evaluation) competencies, and competencies in ICT. Our main interest concerned the use of web 2.0 and mobile technologies. These two directions determined us to explore their use within the framework of a collaborative project, initiated during the practical activities related to the “Vegetal biotechnology” course.

2.2. Participants

A group of 10 students in Biology (the usual number for practical activities in our university) has been divided in two teams, according to their preferences. Each team has been completed with a student in Communication Sciences (third year) and a student in Accounting and Management Information Systems (second year). Both teams benefited from the counselling of a graduate in Pharmacy, who volunteered in this project. The team of teachers was made of specialists in the following fields of science: Biology, Chemistry, Computer Science, and Economics.

It is a frequent practice in our university that students may enrol for extra-courses, which are included in the curricula of other specializations. For example, students in Computer Science usually choose to attend the Genetics course, because they need to know the basic concepts for the Natural Computing course (an elective one, within the package of Artificial Intelligence courses). Therefore, the participation of the guest students in the activity was normal and, to all intents and purposes, was received with enthusiasm.

2.3. Experiment design

In order to provide an answer to the suitability of web 2.0 facilities and mobile technologies in learning Biology, we chose to design an experiment in three stages, as follows.

The first one was a face-to-face work session, when the Biology teacher presented several issues regarding GMOs and the use of biotechnologies to obtain them. Then the idea of the project was presented to the students: the two teams were asked to realize a material designated to raise awareness among high-school students. They were
explained that they need to adjust the content and presentation style to this target group, in such a manner to give an impulse to further research and study. In order to collaborate within each group, they were asked to use an online environment (Netvibes was presented by the Computer Science teachers, but its use was not imposed). The request to get an insight into the molecular level of the matter was addressed.

The second stage lasted for two weeks and was used, by each team, for: internal organization, task allocation within each team, documentation, research, and design of the deliverables.

The third stage was again a face-to-face session, when the deliverables were produced using personal devices only (laptops, notebooks, tablets, smart phones), presented, and evaluated. The two student teams, the teachers, and guests were present. Discussions took place, students cross-evaluated the output materials, while teachers evaluated both teams.

3. Findings and results

3.1. On the evolution of the experiment

After the first face-to-face session, the students crossed a two weeks period and worked unsupervised. Teachers only accessed the collaborative Netvibes pages, checking on the content they uploaded and/or followed. Both teams included tabs such as: documents (retrieved with various search engines), videos, news, and conversations. At this stage, we have looked upon two issues related to the information they have investigated: how they searched for it, and the relevance of the sources. Practically no demand for teachers’ support was addressed during this period.

The second face-to-face working session was four hours long. During this blended activity, the students put together their ideas and produced the deliverables. We observed: how their plans were made, how they divided tasks, communicated with each other, processed information as to reach their goals, integrated the pieces and various types of information, if they properly used the tools. Both deliverables included text, computer graphics, and sound. The presentations lasted for an hour and ended the third stage. Along thirty minutes, each team built up an oral presentation and discussions took place. The peer assessment between the two teams and teachers’ evaluation ended the activity.

3.2. On the scientific content of the deliverables

The following issues have been synthesized in the deliverables and extensively debated in the oral presentations:

a) Concept of genetic diversity, as an essential condition for the evolution of all species and for the equilibrium of natural ecosystems.
b) Definition of GMOs - organisms who suffered modifications at molecular level, through addition of foreign genetic material.
c) Techniques to obtain GMOs, pointing especially on recombined DNA technology.
d) Modern technologies for GMOs production, such as new physical and chemical methods used to include exogenous DNA into the vegetal cells.
e) Practical results obtained with DNA technology, mainly reminding new genera of genetically modified plants which are important for food production.
f) Advantages of techniques that produce GMOs. The most important have been explained, especially the economic ones.
g) Disadvantages. Students pointed that natural genetic biodiversity should be preserved.
h) Controversies. These were linked to: food safety, public health, and environment safety (Conner et al., 2003).

In addition to the scientific content, its soundness and relevance to the project, teachers tracked if and how the students made correct references, citations and links.

3.3. On students’ knowledge and skills

We observed students’ skills looking upon the national requirements for the bachelor graduates in Biology. As the curricula stipulates, during the three-year study period the students need to acquire the information that allows:

a) Use of basic knowledge in order to explain and interpret various types of concepts, situations, processes, and projects within the field of Biology.
b) Inter- and trans-disciplinary integration of the specific knowledge in order to
assess the support capacity of the biological systems for the socio-economic environment. c) Evaluation of the stability/evolution of the biological systems, of biodiversity, in terms of sustainable development. Moreover, skills related to the development of professional projects with the use of dedicated principles and methods in the field of Biology must be achieved. As transversal competencies, we list: a) Identification of the proper role in a team and commitment to the responsibilities corresponding to their personal and professional profile, and b) Responsible and efficient accomplishment of the tasks related to the professions in the area of Biology, in conformance to the professional ethics.

Given these long-term objectives, we have observed each category described above and recorded our observations. During the face-to-face sessions, we acted towards leading students’ behaviour, actions and attitudes, offering our support. The assessment form integrated our view on students’ competencies, as described in 3.4.

Even the two students in Communication Sciences helped their colleagues in using mobile devices and managing the collaborative sites, we paid special attention to the ICT-skills of all the other students. ICT enhanced skills are needed not only for completing their studies, but for their future development, according to the needs of the modern society (Diepen et al., 2012).

The team working skills, working-on-a-project skills, and presentation skills have been studied through direct observation during the face-to-face sessions, analysis of the deliverables during and after their presentation, and discussions with the members of the two teams.

3.4. Evaluation of the deliverables

For the evaluation of the two deliverables, we used four criteria, each one measuring the quality of the deliverable from a different perspective (Lê & Lê, 2007). For each criterion, several indicators (measured on a scale from 5 to 1, where 5=excellent and 1=poor) have been proposed, as follows: a) Content: Information is adequate for the intended purpose; information is correct; information is up-to-date; information is useful; information covers the theme; text information is intelligible; images/graphic/animation/sound are suggestive; degree of objectivity in presenting the information. b) Structure: Structure of the deliverable is coherent; consecution of the sequences is logical; links are present; references are present; originality of the structure; adequate duration. c) Aesthetics: General aesthetics; attractiveness; adequate chromatics; unity of the deliverable. d) Impact: The deliverable stimulates the curiosity/desire to find more on this topic; the deliverable incites to reflection.

Apart from assigning a mark between 1 and 5, the evaluators were allowed to make some remarks or offer a global feedback on each criterion. Table 1 presents the average results for the four criteria, as assessed by the advisors. A second evaluation, computed from the marks of the advisors (weighted 0.7) and peers marks (weighted 0.3) lead to very close results: 4.48 for team 1 and 4.41 for team 2. Indeed, the debate occasioned by the presentation of the two deliverables revealed that the two teams had very similar potential, and was appreciated by the students to be as useful as the elaboration process itself. The two materials may be available on request.

Table 1. Advisors’ evaluation of the deliverables

<table>
<thead>
<tr>
<th>Teams</th>
<th>Content</th>
<th>Structure</th>
<th>Aesthetics</th>
<th>Impact</th>
<th>Global evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team 1</td>
<td>4.73</td>
<td>3.94</td>
<td>4.79</td>
<td>4.92</td>
<td>4.60</td>
</tr>
<tr>
<td>Team 2</td>
<td>4.75</td>
<td>3.69</td>
<td>4.71</td>
<td>5</td>
<td>4.54</td>
</tr>
</tbody>
</table>

4. Conclusions and further work

The potential of mobile devices to support education is more and more explored (Dykes & Renfrew Knight, 2012), due to the main features that this technology brings into the learning process: authenticity, collaboration and personalization (Kearney et al., 2012). As well, web 2.0 facilities are very familiar to the students (especially social software). During the experiment, we observed that students master these tools and they were pleased to use them for a practical, social-related task. The deliverables they prepared were appealing, although we expected more than PowerPoint presentations. If students didn’t succeed to process new ways of displaying their work, instead they
managed to organize a collection of applets and midlets for biology, which they discovered during the information search process. Blending learning with everyday technologies takes advantage of students’ interest and willingness to use these technologies. Lord (2001) listed 101 reasons for which we should teach biology in collaborative environments. Our experiment allowed us to certify a wide palette: enhancement of thinking and understanding, satisfaction towards the learning experience, increased creativity, commitment to the team and task, empathy, courage to stand for their opinion. Students also appreciated their input into the evaluation process, showing objectivity and a critical view on the materials (consequently, the average scores that include students’ marks were smaller than those of the advisors).

Moreover, the experiment revealed students’ individual strengths and weaknesses, and boosted their interest in linking school to the social context. Its success encouraged us to plan new types of collaborative activities for future: co-teaching, linked courses (with common assignments or even joint graduation theses for students in different tracks of study), weekly meetings or seminars for related courses. Another direction for us will be to carry out some activities outside the university environment, which is highly adequate for biology teaching and learning.

As teachers, we need to model social responsibility, because learning of life sciences “is not isolated from politics, social norms, or the paradigms of the time” (Chamany et al., 2008). With our approach we hit one of the major objectives of education: to prepare students for real life.

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References


