Collaborative learning and interdisciplinarity applied to teaching entrepreneurship.

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Abstract

This paper describes an experiment based on using collaborative learning tools for acquiring the competences considered necessary for creating new business models and formulating them in business plans.

The main aim of the teaching methods used was to improve student learning through working in multidisciplinary teams.

The results flag up the potential of the wikis available on virtual campuses to create work environments in which students from different disciplines can participate. Furthermore, the difficulties encountered are presented as areas to be taken into account in future experiments.

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1. Introduction

Over recent years, the context of university teaching-learning procedures has been changing at a considerable pace. This statement rests on two main arguments. The first of them is the European Higher Education Area (EHEA) which is changing university teaching methods and objectives, steering the work of lecturers towards ensuring that students acquire a set of competences. The second is that university students have the technological skills which enable them to acquire knowledge through new channels.

In recent years Spanish universities have embarked on the process of moving towards the EHEA. New study programmes have been designed which require students to acquire a set of competences. The opportunity thus offered has been taken and used to include new competences which determine teaching and assessment methods, and must be a reference for teaching innovations in courses on entrepreneurship.

University students today spend part of their time using Web 2.0 tools. These students are what is termed “digital natives”, and they have become more numerous as new technologies have developed (Prensky, 2001; Ajjan and Hartshorne, 2008; Pascu, 2008). This situation has made it necessary to analyse how Web 2.0 technologies can be used in the educational environment (Griffith and Liyanage, 2008). According to Armstrong and Franklin (2008), the gradual inclusion of social media in university methodology is having a negative effect on the privileged position of the university as a system for creating and transferring knowledge, since there are now other sources which promote knowledge creation and dissemination.

Web 2.0 technologies provide a space for interaction and communication so that collaborative creation of content can take place (Collins and Moonen, 2008; McLoughlin and Lee, 2007). Social software (Kesim and Agaoglu, 2007) brings together tools which enable content to be tagged (such as Internet bookmark Delicious), content to be created (blogs and microblogs such as Blogger, WordPress and Twitter), content to be shared (Flickr and YouTube), spaces to be constructed collectively (wikis) and...
different types of social networking sites to exist (Facebook and LinkedIn) (Dabbagh and Reo, 2011; Kitsantas and Dabbagh, 2010).

New media have burst onto the teaching methodology scene in recent years (Ellison and Wu, 2008). These media have been highlighted for their potential for use in the higher education teaching-learning process (Brown, 2012; Wheeler, 2009; Ajjan and Hartshorne, 2008; Churchill, 2009; Ellison and Wu, 2008; Top et al., 2010). Using social software in university education gives teaching a collaborative angle and makes it possible to enhance interaction between all the participants in the teaching-learning process. It results in students taking on a more active and substantial role (Hilton, 2009, Collins and Halverson, 2010; Cress and Kimerle, 2008; Schroeder, Minocha and Schneider, 2010; Wodzicki et al., 2012).

The benefits of using new technologies have been amply argued. Laru et al. (2012) refer to studies which highlight the benefits of blogs (Churchill, 2009; Ellison and Wu, 2008; Yang, 2009; Halic et al., 2010; Wheeler, 2009, Hemmi et al., 2009; Xie et al., 2008), wikis (Cress and Kimmerle, 2008; Wheeler, 2009; Hemmi et al., 2009) and social networking sites (Arnold and Paulus, 2010). He does, however, and along with Crook (2008) and Meyer (2010), draw attention to the scant existence of empirical studies on the impact of Web 2.0 technologies in higher education.

This paper describes an experiment in this regard on promoting collaborative learning. The principal benefits of collaborative learning for the individual are: that it increases motivation amongst group members; that group members perform better academically; that the knowledge acquired is better retained; that it encourages critical thought; and that the learning process itself benefits from the diversity of knowledge and experience existing within the group. In this instance, wikis were chosen as the tool for channelling the interaction between students from different disciplines. Taking part were students of the “Setting up a technology spin-off” subject, part of the Advanced Master of Biotechnology programme, and students of the “Business Development” subject, part of the Master of Business Administration programme at the University of Malaga. Both are officially recognised programmes.

The primary objective was to develop ideas for new businesses linked to technological innovations in the field of biotechnology. The diverse secondary objectives pursued by teachers are shown in the table below:

<table>
<thead>
<tr>
<th>Relating to teaching the courses involved</th>
<th>Relating to innovation in teaching</th>
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<tbody>
<tr>
<td>To develop business ideas relating to technology that can generate new spin-offs in the University of Malaga.</td>
<td>To discover the main limitations and problems with student participation in the wiki.</td>
</tr>
<tr>
<td>To teach students how to use collaborative tools.</td>
<td>To improve our knowledge of the methods for assessing the results of group work.</td>
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<tr>
<td>To generate new skills for group work.</td>
<td>To improve the skills of educators in using collaborative tools in their teaching methods.</td>
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<td>To assess the knowledge acquired by students in the different courses involved.</td>
<td>To transfer the experience gained to other courses and newly-created ones in “Entrepreneurship”.</td>
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<tr>
<td>To help students get the most out of multidisciplinary working</td>
<td>To contribute new experiences and knowledge to the development of collaborative learning.</td>
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</table>

2. Teaching Methodology and Design

The purpose of the project is to promote collaborative learning by students enrolled on official postgraduate programmes at the International University of Andalusia and the University of Malaga. Taking part in the teaching experiment were students on the Advanced Master of Biotechnology programme, whose areas of competence enable them to determine innovative technical processes in the field of biotechnology. These students worked alongside students on the Master of Business Administration programme, whose areas of competence enable them to evaluate the coherence and viability of business models and introduce elements of organisational and business innovation.

The Advanced Master of Biotechnology programme includes an elective subject, “Setting up a technology spin-off”. This subject aims to impart the competences required to define a new business model and formulate a business plan for setting up a biotechnology industry company in response to a given technological innovation. The Master of Business Administration programme includes the “Business Development” subject. Amongst the goals to be met and competences to be acquired in this subject is training students in how to set up a new business, analyse project viability and formulate business plans.

Thirty students took the “Business Development” elective in academic year 2011-12. Six students on the Advanced Master of Biotechnology programme took the “Setting up a technology spin-off” elective. A total of thirty-six students thus took part in the teaching methodology.

The collaborative tool chosen to facilitate work was the wiki. A wiki allows students of a given course to create a document working in collaboration with other students. Wikis can be used in a number of ways in the teaching environment: for making
notes, brainstorming, participating in other wikis and managing group work. The latter is the most widespread example of use and the one which generates the best results. In this instance, the wiki provided a workspace in which the different members of a group could add the information obtained and create group documents. Given this use, the teaching methodology designed required students to work together on creating a document. The methodology used followed the stages described below:

A) Drafting materials and making teaching procedures uniform.
   The first stage of the project tackled the need for teaching procedures for the “Entrepreneurship” subject to be made uniform, so that all students received similar training. To achieve this goal, a shared guide was used for drafting business plans in teaching “Entrepreneurship” subjects and “Business Development” elective on the Advanced Master of Biotechnology and Master of Business Administration programmes. Shared methodology was similarly used for creating business models based on business ideas or opportunities. Additionally during this stage, the team of lecturers taking part drew up learning guides to show students how to use the wikis created to help them work together as a group.

B) Teaching students to use collaborative tools on the University of Malaga's Virtual Campus.
   The aim of this stage was to teach students how to participate in a wiki using the Virtual Campus. To this end, students were given a learning guide created by lecturers, the “Guide for embarking on collaborative working practices”, which gave students tips on how to participate in the wiki, its degree of importance for the course and how student participation in it would be assessed.

C) Classroom lectures for the Biotechnology and Business Administration programmes.
   The aim during this stage was to impart the competences required for defining new business models and formulating them in business plans. The classroom lectures for the Advanced Master of Biotechnology “Entrepreneurship” course coincided with the start of collaborative web-based work in terms of scheduling. However, teaching on the Master of Business Administration programme took place three months before the joint teaching method.

D) Development of collaborative work.
   First, students taking part in the teaching method were organised into five different groups, each comprising one student from the Biotechnology programme and five from the Business Administration programme. Master of Business Administration students were assigned to groups randomly. To facilitate collaborative working between group members, a wiki for each group was set up on the University of Malaga Virtual Campus. A forum for each group was also set up so that group members could interact, hold discussions and make decisions about the work.

   The collaborative work began in each group with the Biotechnology student presenting to fellow group members an idea for a business spin-off linked to a given technological innovation. Students then embarked on a discussion for which the first outcome required was the description of a coherent business model founded on something innovative which would make the group's proposal stand out. The group was then required to analyse the possible threats to, opportunities for, strengths and weaknesses of the project. In this regard, the work did not look at defining the entire Business Plan or analysing Project Viability. The activity was restricted to defining the business model and carrying out strategy analysis due to time constraints and the need to adjust assessment to the content of the “Entrepreneurship” course on the Advanced Master of Biotechnology programme.

   The lecturers involved took on tutoring tasks for each of the groups so that they were available to answer any questions students in the groups might have. Lecturers also played a part in boosting the dynamic of the work group. This principally involved encouraging use of the forum created for each group. Fourteen days were allocated for completion of group work.

E) Assessment of student performance.
   Results were assessed in order to grade each of the different subjects forming part of the project. The team of lecturers made an individual and final assessment of students which took into account both the results of group work, and the participation of the student in group work and via the Virtual Campus. In this respect, it is important to highlight how the Virtual Campus made it possible to track each version of the documents created and thus reveal each student's participation in and contribution to their creation.

F) Assessment of the results obtained as a result of teaching innovation.
   Once students had completed their work, they were asked to fill in a questionnaire to assess their level of satisfaction with aspects of collaborative work and web-based work. Thirty students filled in the questionnaire, answering both open and closed questions and expressing their feelings regarding participation in group work, what the main problems they had encountered were, their evaluation of the assessment method and which areas they considered could be improved.
3. Results

Different performance and results were observed in each group. This was due to external factors which gave rise to unequal levels of work. Goals were met in a highly satisfactory manner in four of the six groups, a total of twenty-two students. The two groups with poorer output suffered from low levels of participation by some of their members. Of the entire set of thirty-six participants, six students did not take part in the work project assigned. These students were concentrated in two groups. This chance state of affairs had negative effects on the motivation of other members of the group and on the results obtained. We therefore conclude that in small work groups, the random assignment of students to groups can create unequal performance across the set of groups.

The experiment overall was positively assessed at 4.2 (on a scale of 1 to 5) by the thirty students who filled in the questionnaire. The response to the open question “what is your general assessment of the work carried out on a group basis?” indicated a very high level of satisfaction with the results of the work and the participation of the student in multidisciplinary teams. Students filling in the questionnaire gave a score of 4 out of 5 as regards the benefits of repeating the experiment with other courses. Likewise, they stated that their involvement in group work had a positive effect on learning course content and that the quality of content and comments shared was satisfactory (4). Equally, the validity of a multidisciplinary approach for achieving better results in the procedure for creating business models emerged clearly. 73% of the students stated that they had never used this type of software before to undertake group work using virtual environments. However, answers to open question “What were the main problems you encountered?” did not indicate in any instances problems with the technical skills required to use collaborative working tools. This response confirms, on the one hand, the huge potential of collaborative software as a tool for use in university teaching, and on the other confirms that it is little used in current teaching methods.

The students flagged up the following problems:

- Timetabling conflicts. The Advanced Master of Biotechnology and Master of Business Administration programmes had different study programme calendars. In effect, students of the latter had finished the academic year and begun the period of professional placement included as part of the programme. The “Business Development” lectures were given in February, whilst the “Setting up a technology spin-off” lectures were given on 30 and 31 May and 1 June.
- Insufficient time. The group-based activity was allocated a period of fourteen days, which turned out to be insufficient for more interaction to take place and the work to be more fully developed. The issue of insufficient time was largely dictated by differences in study programme calendars and by when the subject was scheduled to be taught on the Advanced Master of Biotechnology programme.
- Dialogue flow. Conversations in virtual environments do not follow the same sequence as they do in physical environments. Although a forum was set up for each group, there was still a time lapse between questions asked, suggestions and proposals made and answers offered. This time lapse was longer if participants’ timetables did not coincide for group work. Separately, some students found it harder to express opinions and judgements in the written, rather than spoken, form.
- Some of the groups experienced problems of unequal or zero participation by group members.

In addition to the fact that some group members did not participate, the differences can also be explained by the emergence, or not, of different roles within the group. Students were asked whether they had noticed different roles emerging in their group. The answers collated revealed that in groups put together randomly and in which functions and responsibilities were not defined at the outset, different roles emerged naturally which governed the end result. The roles described below were highlighted:

- Leader, i.e. the person who posts messages of encouragement, flags up deadlines, assigns tasks or answers questions from others.
- “Devil’s Advocate”, i.e. the person who helps to improve the outcome by raising questions and making objections about how the work is progressing.
- Followers, i.e. group members who are more passive and take on predefined tasks.
- Methodical, i.e. group members who focus on details and on working in line with the methodology proposed in order to undertake the work and achieve the goals set for it.
- Creative, i.e. group members who stand out for coming up with original solutions and achieving rapid agreement amongst the rest of the group.

The competences most favoured by using collaborative working practices were the ability to convey information, to apply the knowledge acquired, to learn collectively, to work as a team, and to interpret and assimilate the information received. They
match those most often cited in dissertations for the different Business Administration degrees passed in Spanish universities (Martinez et al., 2011). We can therefore conclude that using wikis is a valid option for improving the new competences defined in the European Higher Education Area.

4. Conclusions and usefulness of results for improvements to teaching

The lecturers involved in the project assessed the outcome very positively, and considered it to be a channel worth developing further in the interests of improving teaching. The students likewise expressed a high level of satisfaction at being able to improve their learning through the use of collaborative tools and working in multidisciplinary teams. The use of collaborative tools such as wikis had an effect on the level of skills achievement in two topics on the “Entrepreneurship” course. Such tools were revealed to be particularly useful for improving information transfer skills, applying the knowledge acquired, learning collectively, working as a team, and interpreting and assimilating the information received.

The multidisciplinary nature of the work groups made it possible to improve learning outcomes and develop ideas for business spin-offs based on innovations in technology. In this regard, we consider it highly recommendable to set up shared workspaces for students with complementary competences. Students enrolled on Business Administration undergraduate or postgraduate programmes are particularly apt for working with students from other disciplines on “Entrepreneurship” subjects.

Separately, the experimental use of wikis in teaching methods revealed a number of difficulties to be borne in mind for future experiments. Firstly, planning the multidisciplinary teams must be taken onto account when organising the teaching schedules of the programmes involved, otherwise problems arise with students being available at times which do not match, there being overlap with tests and activities for other subjects, and different work rhythms.

Similarly, we consider that the outcome of teamwork learning depends in large part on the composition of the group. Here, it is important that within the group its members take on different roles naturally. Distributing students across groups in a random fashion can therefore create situations which are difficult to straighten out. Lastly, it is clear that group interaction in the virtual environment needs to be complemented with actual face-to-face meetings.

The experiment described in this paper could be considered when putting together the content for “Entrepreneurship” in the study programmes for new degree courses. Its results would doubtless be highly valuable in designing the “Entrepreneurship” content for new degree courses, in designing teaching methodology and in repeating collaborative experiments with students on different degree courses.

In addition, it is highly likely that a large proportion of the new postgraduate courses passed by students at the University of Malaga will include subjects and topics relating to “Entrepreneurship”. In this regard, the proposal could be given some thought by the Heads or Coordinators of postgraduate programmes for professionals trained to think about and come up with technological innovations.

Similarly, the multidisciplinary experiment may lead to improvements in the teaching activities designed across Spanish universities as a whole for promoting entrepreneurship and knowledge transfer.

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