An analysis of third level interdisciplinary student learning outcomes using Wiki technology tools– an evaluation of Germany and Ireland University students

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Abstract
Enhanced collaboration among multicultural European countries is necessary for effective enterprise development and innovation. The current climate of an increasingly challenging competitive global economy provides opportunities to explore alternative methods of enterprise sustainability including the creation of collaborative clusters of individuals working together towards a common goal. As such, the training responsibility for facilitating effective collaboration into the future rests mainly with the third level institutions. Students must be provided with opportunities that simulate real life scenarios. Students should be trained in how to collaborate with other partner European students working towards a common goal regardless of Host University. One method of providing European students the opportunity to liaise with each other, regardless of location, is offered through the use of Wiki technology. Combining various international teams from different cultural backgrounds enhances graduate expertise and develops a skills set for high end product and service innovation. Wiki technology and the facilitators provide the tools and the environment that enables students to contribute to a common purpose in a collaborative manner. The Internet based Wiki provides a many advantages including a platform for connecting students from around the world who can work together in a virtual way. These collaborative practice scenarios will provide opportunities to students to simulate real life decision making in many areas but especially in high value manufacturing and in research and development.

The previous paper explored the implementation of Wiki technology as a teaching enhancement tool in the classroom in NUI Galway, Ireland. An examination of the benefits and constraints of Wiki as a teaching tool were presented at the EdTech conference in Dublin, Ireland in June 2009. This paper will further examine the findings of the use of Wiki technology as a teaching enhancement collaborative tool in Chemnitz University of Technology, Germany in July 2009 and will ultimately compare the findings of the Irish study to the German study. Future work in this area includes

internationalising the university classroom activities to facilitate on-line international team based student projects.

Background

The increasing need for effective collaboration among interdisciplinary groups suggests the necessity of developing teaching pedagogy that infuses teaching techniques with technologies. Combining Business and Engineering graduate expertise is paramount in developing skills set for high end product and service innovation. Opportunities also arise if groups have experience and familiarity with other cultures. A collaborative teaching tool that can combine business, engineering and cultural opportunities is Wiki. Wiki provides an environment that enables students to contribute to a web page in a collaborative manner. The Internet based Wiki provides a many advantages including a platform for connecting students from around the world who can work together in a virtual way.

Case Study

This case study examines the integration of Wiki Technology with Face-to-face teaching to an undergraduate engineering class in Chemnitz University of Technology, Germany held in July 2009. The learning environment was supported by the PB Wiki virtual learning platform which utilised the *Learning Objects Teams LX* building block to create group wikis.

The German scenario is compared to previously presented Irish results at the EdTech conference in May 2009 where an interdisciplinary undergraduate class ulilised face-to-face teaching combined with a learning environment supported by the NUIG Blackboard virtual learning platform utilised the *Learning Objects Teams LX* building block to create group wikis.

Nowadays, graduate real-time collaborative expertise is paramount in developing skills sets leading to product and service innovation. Export opportunities also arise if groups have experience and familiarity with other cultures. Historically, Ireland has successfully exported indigenous products to Germany. As an example, in 1973, following Ireland's accession to the EEC, an Bord Bainne (the Irish dairy board) launched the Kerrygold butter product in the North Rhine WestPhalia region of Germany. This was followed later by national distribution in Germany in 1982. Germany is a very important consumer market for Ireland's Kerrygold products, where it is the leading butter brand. Exports from Ireland to Germany accounted for 6.9% in 2009 and Exports from Germany to Ireland in 2009 had a value of 3.0 billion EURO accounting for nearly 0.4%. Cultural knowledge combined with wiki technology could be useful as a competitive business weapon.

A key element of the student learning environment employed in both the Irish and German scenarios centres on individual, small group and whole group activities aimed at developing problem-solving approaches and strategies to resolve issues indentified

across a range of case study scenarios. This situation simulates real time problem solving.

Groups are set up and are then allocated a wiki which serves as a communication and collaboration space to develop group responses trigger questions. During class contact time, a common case study is distributed to each group for analysis and discussion together with a number of trigger questions for group consideration and group resolution. Groups are asked to upload their co-constructed response via their group wiki in real-time. Groups are then invited to present their summary responses to particular question to trigger whole-group discussion. While wiki membership editing rights are restricted to the immediate group, all members enrolled in the module can view each other's wikis. This opens up the prospect of peer-review and evaluation exercises and allows knowledge sharing amongst the wider cohort.

The principle wiki activities take place in the classroom setting. However, wiki access is available outside the class contact time for further edits, additions, comments and reflections. All group members have permission to export a .zip file copy of their wiki and this can be used to demonstrate team work and collaborative working practices to external stakeholders, such as potential employers.

Evaluation Methodology

This case study was evaluated using student questionnaires, group reflective exercises, individual student video interviews and lecturer video interviews.

1 Affordance of the Technology

57% of the German students had not used a wiki previously compared with 84% of the Irish students. An entire student cohort found the wiki software easy or very easy to use. On further examination, 58% of the Irish students and 57% of the German students found the wiki software very easy to use. 42% of the Irish students and 43% of the German students found the wiki software easy to use.

The student feedback also identified that the Wiki page was easy to edit with 95% of the Irish students in agreement and 100% of the German students found editing easy.
The addition of a new page to the Wiki was found to be an easy task with 87% of the Irish students and 100% of the German students finding this easy. During the period that the students worked on the Wiki there were no reports of the Wiki was unstable or crashed. There were however some issues concerning the formatting of text that had been copied from MS Word into the wiki space raised by the Irish students.

90% of the Irish and 100% of the German students found that the technology was stable
96% of the Irish and 100% of the German students were very satisfied with the 24/7 access provided to their group wikis . There were no browser issues of concern to either cohort.

Critically, being able to export and take a copy of the Wiki is important to all the students as it allows them to provide evidence of group work activities.

Irish Students contributed reflective comments such as:

> 'I am not great at computers but it's really easy to use the wikis.' [Irish Student 1]
>
> 'It's very very easy; very very simple.' [Irish Student 2]

German Students contributed reflective comments such as:

> ‘Exchange of knowledge in a group using a Wiki is important for a detailed solution of a problem.’ [German Student 2]
>
> ‘The Wiki could be used for documentation purposes in a factory. It would allow for collaboration within the factory. ‘[German Student 3]

2 Collaboration

The students explained how they used the group wikis:

> 'We use the group wikis to tie in the class theory with practical case studies. It gets you to think outside the box. You think 'this is the real world.' [Irish Student 3]
>
> 'We can edit together as a group in class, and then go afterwards and contribute online strategies amongst the team. We use the wikis to coordinate groups so that we can get together outside the classroom. It has transformed the learning from two hours in class to several hours outside the classroom.' [Irish Student 4]
>
> 'The wikis builds up into a portfolio of case studies, strategies and ideas. We can then compare and the various strategies and approaches.' [Irish Student 1]
>
> ‘We identified the team leads, who worked with the Wiki and coordinated the function/method of operation. We discussed in several stages: 1.collecting ideas/brainstorming 2.Catrgorising collected facts.’ [German Student 1]’
>
> ‘I was motivated by watching our solutions progressing. Deeper learning experience by exchange of knowledge with other groups.’ [German Student 2]
>
> ‘If you can see the progress and see the information of the other groups. So you can have a deeper learning experience. Communication and discussions.’ [German Student 3]

3 Co-Construction of Knowledge

The students appreciated the benefit of working in groups and clearly identified the 'real-world' relevance of replicating industry scenarios and problem-solving activities in the classroom.

> 'It's about learning by doing; by interacting and getting ideas from other people. We have shared our details within the group. It's a challenge to work in a group but it's also fun. If there are conflicting issues, we can challenge them as a group and come to a consensus.' [Irish Student 3]

> 'The wikis allow multiple ways to come up with a final answer and opens up new ideas. It's a great way to get group and class feedback. You learn a lot from that. It's a good challenge for future life and working in industry.' [Irish Student 2]

> '1. Listening to different opinions
> 2. Discussing topics
> 3. Getting feedback from the group.' [German Student 2]

> '1. More idea/solutions
> 2. Immediate feedback on your own ideas
> 3. Sharing the tasks/work.' [German Student 5]

4 Engagement

Students liked working in groups and say the relevance of using their wikis to aid their activities:

> 'You are helping your classmates. It helps to learn how to work in a group which is essential for project work. It's definitely a better way of learning because it's practical and more of a real working environment.' [Irish Student 6]

> 'Everyone has a connection to the internet - knowledge available
> Everyone can work together on the project.' [German Student 6]

The students indentified opportunities to apply their learning to wider contexts:

> 'When in other classes I'm thinking: 'there are better ways to do this' having used wikis in group situations.
>
> I did a placement with Boston Scientific and will be returning there in the summer. Wikis would be great to use with colleagues in the United States. I could see that this could work very well for collaborative projects between Galway and Boston and if you were dispersed throughout the company.' [Irish Student 8]

> ‘After providing our results to the Wiki we had access to all the other group results and now if we need to improve our project.’ [German Student 8]
>
> ‘I got a new impression of using a Wiki to consolidate results and harmonise them with other students. It did not help me directly within my subject, but it is a new dimension of information management, easy to use in every field and by nearly everyone.’ [German Student 1]
>
> ‘Working in international project teams could be much easier, even when the participants are located all around the world. Using Wiki will attend me on my further wasy at university and also in industry. Even when working on small projects at university I'm going to try to use Wiki's whenever possible.’ [German Student 8]

All students commented that a motivating factor in their engagement with the environment was the opportunity to take a personal copy of their wiki to showcase their achievements to external audiences, such as potential employers.

The following comment indicates student use of the group wiki to aid personal reflection on learning and knowledge gained through the learning activities:

> 'Because we can access the wiki permanently, and take our own copy of the wiki, I can look back see what I wrote and how I wrote it. That's when I'll really recognise the leaning.' [Irish Student 4]
>
> ‘Advantage 1: Group work, team work
> Advantage 2: Communication base, deeper team effect.’ [German Student 3]

Course Coordinators Ralph Riedel and Mary Dempsey felt that the use of wikis has proven successful in facilitating knowledge construction and exchange:

> ‘The wiki tool was new for our students. My observation was that students got access to that technology very fast and after the seminar I received some feedback that it has been helpful for idea exchange especially in a team. The seminar will surely enhance the ability of our students to use sophisticated technology and tools which will improve students’ abilities in problem solving. We will enlarge the use of this technology in different settings.’ [Ralph Riedel]
>
> 'The use of Wiki technology as a pedagogical tool has really engaged the students. I have had a wonderful time observing the group dynamics and problem solving approaches demonstrated in the class. The wiki tool was seen as cool, novel and engaging, and very much supported the simulation of real-world scenarios. We aim to expand this successful example of student engagement by

setting up international student teams from various third level universities worldwide facilitated by Wiki technology.' [Mary Dempsey]

5 Conclusions and Future Plan

The responses from the Irish and German students indicate that incorporating Wiki as an on-line collaborative tool resulted in extremely engaged students who became self motivated both inside and outside the classroom. The responses also highlight that the learning outcomes set at the start of the semester were achieved. The results suggest a deeper understanding of the course materials when compared to rote memorisation as students deepened their engagement and are required to use some of the higher level cognitive styles from the Bloom taxonomy. The Groups also rotated the leadership role and this facilitated group problem solving, communication and leadership skills enhancement. Disadvantages of integrating Wikis into teaching were minimal.

The authors plan to create European and International Wiki platforms. Students from Germany and Ireland will be soon facilitated through Wiki technology to work together on teams to evaluate cases in the area of operations strategy. The plan also extends to allow on-line collaboration with future international partners.

Presently a team of five students from five different countries worldwide form each of four continents are working together on a pilot project forming an on-line international wiki team.

Future analysis will be to create structures to identify collaborative fears, system boundaries, as well as advantages and successes etc. The opportunity to set up this scenario stems from an existing Erasmus program between Chemnitz University and NUI Galway and also the award of recent funding secured under the Higher Education Authority cultural exchange programme.

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