Embedding Interuniversity Peer Review in Virtual Learning Groups

A Research-Based Learning Scenario

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Abstract. Interdisciplinary cooperation in virtual groups has become a reality and challenge for businesses and institutions in the globalised world and thus a main learning objective for business students. This paper reports an inter-university cooperation between a German University of Applied Sciences and an Austrian University, in which students of both institutions work together in virtual learning groups. They collectively develop a research project concerning "ethical issues of digital communication". The students pass the different stages of a typical research process starting with a relevant research question towards the presentation of the findings at a conference. For this research-based learning scenario a process model is developed based on established theory and including a Peer Review process for students from three courses of both universities. An accompanying study collects qualitative and quantitative data on Peer Review as a learning method in an inter-university context and the role of media for virtual cooperation.

Keywords: Interdisciplinary collaboration · Inter-University learning groups · Learning through research · Integrated peer review process · Inquiry based learning · Virtual learning group

1 Introduction

Interdisciplinary collaboration in virtual teams is both challenge and reality for institutions and companies in the globalised world especially when digital business models are involved. This increases the need for virtual communication. This leads to media literacy for virtual learning and collaboration becoming an important learning objective in business education.

In traditional courses, both on-campus and in blended learning style, there is no essential need for the learners to use different media for collaboration in their learning group. That is, because the students can communicate face-to-face in a simple way. This situation changes for non-traditional students in higher education who are working during their studies. For this group of students, virtual collaboration is essential.

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Because of their diverse professional experience, they are not a homogenous group of learners. Thus, interdisciplinary and intercultural aspects gain importance in virtual teams.

Based on this assumption, an inquiry-based learning scenario was developed, in which three universities in Austria and Germany cooperated. In virtual learning groups with members from both Austria and Germany, the students created and worked on a joint research project and presented the selected papers at an scientific conference. In a double-blind peer reviewing process the students gave feedback to their colleagues and the best rated papers were selected for the conference.

The students organised their virtual learning group autonomously and selected the used tools and media in self-responsibility. The development of media skills and abilities for virtual teams was an intended learning objective of the learning scenario.

2 Learning Through Research

Inquiry-based learning is grounded on the philosophy of John Dewey [1], who believed that education starts with the inquisitiveness of the learner, and that learning and researching are corresponding activities. Both activities are focused on cognitive processes. Since the 1970ies, inquiry-based learning and assessment is a main didactical principle of teaching in higher education and documented in a number of papers [2–4].

Inquiry-based learning is a student-centered active learning approach, where the students are part of the whole research process. Learners complete different phases of the research process [5]. Inquiry-based learning activities start with the development of a research question followed by finding adequate research methods and investigating different solutions. On basis of the gathered information, students create new knowledge. The discussion of discoveries and experiences is an essential part of the learning process. At the end of the process, the findings are comprehensibly documented and presented for third parties. Inquiry-based learning encourages a hands-on approach where students practice scientific methods. The documentation and reflection on the personal learning pathway is part of the learning process.

Figure 1 shows Kolb's experiential learning cycle synchronised with a typical research cycle that is basis for the inquiry-based learning model. It regards learning as an interaction of several different activities on the part of the learners, such as dealing with an authentic learning item in a concrete and direct way, reflection, the development of a personal net of knowledge by means of abstract conceptualization and the use of this theoretical knowledge for planning further learning activities. Kolb's [6] model of an experience based learning model is built upon the idea that learning preferences can be described along two continuums: active experimentation vs. reflective observation and abstract conceptualization vs. concrete experience. These four elements are at the centre of an idealised learning cycle or spiral where learners touch all the bases. This starts with any one of the four elements, but typically begins with a concrete experience. The four stages in this experiential learning cycle include concrete experience being involved in a new experience, reflective observation watching others or developing observations about one's own experience, abstract conceptualization

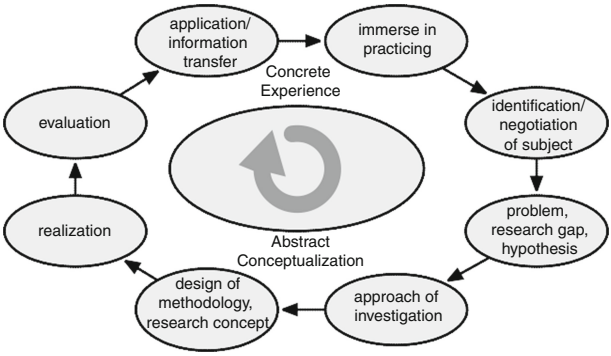

Fig. 1. Kolb's Learning Cycle synchronised with Wildt's Research Cycle [7]

creating theories to explain observations, and active experimentation using theories to solve problems, make decisions.

As it is shown in Fig. 1, Wildt synchronised the research process with the learning cycle. The research process needs to be specified for each discipline, e.g., engineering education differs from social sciences or economic [8]. The research and the learning process starts with observation of problems in the real world and the concrete experience, the students are irritated by a situation or an experience. The defining of questions or problems is part two of the cycle (reflective observation) and ends with the formulation of research questions or hypothesis. The abstract conceptualisation is used to develop a research concept and design. The developed concepts will be verified during active experimentation, and new knowledge will be created. From this findings new learning and research cycles start.

The steps in the research process are connected with the learning steps in the learning process to acquire research competencies and professional expertise. This is the basic principle for developing a learning scenario that connects the two processes.

3 Research Questions and Design Method

For an implementation of inquiry-based learning we evaluated, how far an interuniversity and interdisciplinary scenario, connected to an intercourse approach, could be conducted in a higher education environment (research question 1). Investigation in added values was planned compared to other learning scenarios using Peer Review (2). The intensity and quality of media usage that allows virtual learning in groups was another focus of the study (3). For our design of this learning setting a design-based research approach was employed. Design-based research has demonstrated its potential as a methodology suitable to both research and design of learning environments [9]. Application on inquiry-based learning goes back to problem solving in education practice wherein a "close connection between forming theory and optimizing process development" is allowed ([4] p. 62).

"Design experiments are extended (iterative), interventionist (innovative and designbased), and theory-oriented enterprises whose 'theories' do real work in practical educational contexts" ([10], p 13).

With this focus, a theory driven learning process model was developed and specified that orients on systematics of Wildt using Kolb as evolved in [6, 7] (Chap. 4.2). The resulting process model was first used, evaluated, and refined in three single courses, each in another semester with a homogeneous group of students from only one discipline. It formed a basis to extend and explore the setting internationally over three universities with three different courses, in two different study programs.

As proving evaluation in the design-based research methodology (Chap. 5), a qualitative survey about learning process and learning outcomes was conducted at the end of the course. It is based on 23 protocols and reflections by students and is abstracted on level of 12 learning groups as at least one document per group was submitted.

To collect more data and correlate it to other media based learning scenarios, an online survey about media use and teaching methods was conducted. This quantitative investigation is part of our "CrossTeaching" study, that started in winter term 2010 and includes answers of 770 students of several courses in two German speaking universities. This comparative data from other interregional learning scenarios, such as an interregional case study work, allows to discover specifics and differences regarding the inquiry-based setting.

4 Learning Scenario and Role of Peer Review

4.1 Setting

The conducted learning scenario is based on an intensive cooperation of three different courses embedded in Master programmes of three different educational institutions. This learning scenario is driven by research and utilises Peer Review as one part of its iterative and self-regulated learning process.

The Master programmes involved are "Digital Business Management" (DBM) on one hand, which is run by Johannes Kepler University Linz (JKU) together with University of Applied Sciences (FH) Upper Austria on its Campus Steyr, and "Cross Media" (CM) run by Magdeburg-Stendal University of Applied Sciences on the other hand. Both programmes are characterised by extensive interinstitutional, intercultural and interdisciplinary collaboration. DBM is the first ever Master programme in Austria that is conducted by an University of Applied Sciences together with a research-based University. The curriculum is built by one half of its courses run at JKU in Linz and one half at the FH in Steyr. Students are enrolled in both institutions and utilise the respective learning platforms.

The list of the bespoke courses that are run in a collaborative way and are interlocked in the research process reads as follows: Foundations of Scientific Research (JKU, 3 ECTS); IT-Ethics and Selected Aspects of Gender Studies (JKU, 3 ECTS); Reflexion and Communication (Magdeburg, 5 ECTS).

This makes it clear, that Austrian students need to complete 6 ECTS in their third semester for these two courses, while German students only need to complete 5 ECTS.

This was discussed by students (see Chap. 5), but the fact that in DBM both courses contain contents and works in addition to the cooperation makes up for the difference in credits. 24 students of DBM participated in the courses (12 male, 12 female) and 10 students of CM (4 male, 6 female). Both Master programmes are designed for professionals, which has implications on periods of face-to-face training and on availability for group meetings. Another similarity of both programmes' students is that they share a highly developed media competency and technical affinity. This has significant influence on choice and usage of technology and media for communication.

To increase motivation, a special incentive was provided: If their contributions achieved a certain degree of quality, the students were entitled to participate in the Cross Media conference "Think Cross Change Media" (#TCCM), to present their work at a dedicated track and get their paper published in the conference proceedings [11].

4.2 Process Model

Following Bloom's taxonomy of learning goals [12] inquiry-based learning aims to "higher" dimensions of cognitive processes, which intends a "higher value" of learning progress and knowledge production with students. These higher transfer dimensions *Analyse*, *Evaluate*, and *Create* are mainly addressed by the following process model (Fig. 2).

Students teamed in inter-university learning groups involving one person from master program "Cross Media" and two from master program "Digital Business Management". The exposed task for each learning group was to form a research project and to write an academic article in the broad field of "Ethical Questions of Digital Communication". Principally, groups were responsible for their own organization of

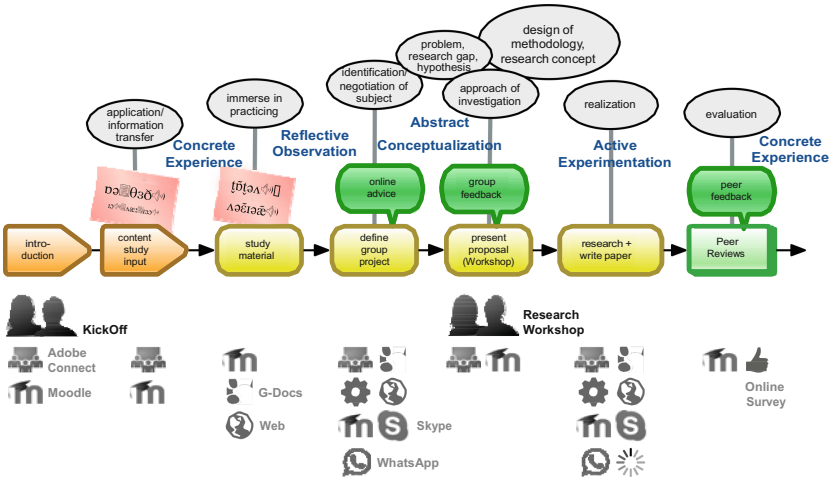

Fig. 2. Research process in first part of the Learning Cycle

group work, choice of tools and communication media, forming research questions, creating their appropriate methodology. This resulted in a broad variety of research methods and approaches. Nevertheless, teachers support like in a seminar about research methods, a research workshop with discussions of all research proposals, or online consulting was highly used.

4.3 Embedded Peer Reviewing Process

As central part of the underlying process a double-blind peer reviewing was conducted, which had high impact on personal motivation, turned out to deliver constructive feedback and acted as a personal learning experience. The students had to hand in a draft of their paper about six weeks before the conference and were then assigned three papers to review from three different groups. The allocation was done manually by the teachers, as the used Moodle Workshop module v2.2 didn't allow for automatic allocation with consideration of working groups. The students received comprehensive oral and written instructions including information on anonymity, feedback and grading as well as detailed evaluation criteria (e.g., quality of content, relevance for theory and practice, originality, formal quality), scales and weights. These instructions have been developed and refined over the last years.[1]

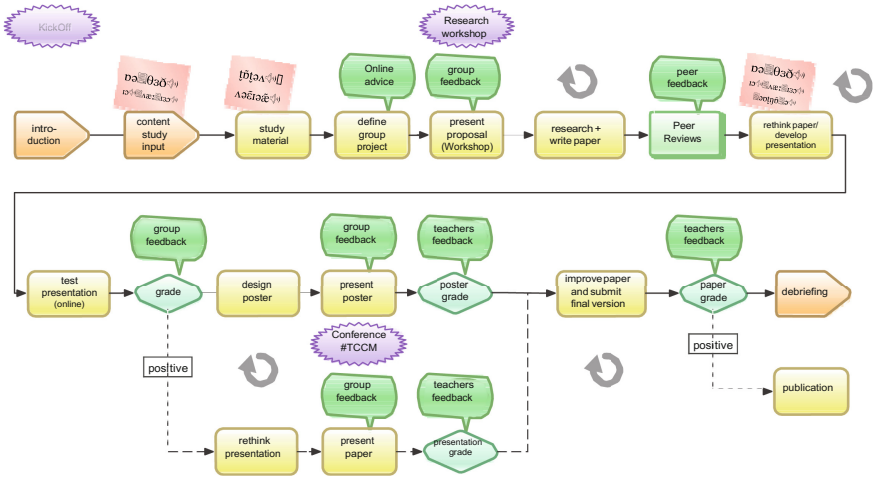

Fig. 3. Full inquiry based learning process model with 4 cycles inspired by Wildt (Fig. 1)

The students had two weeks to hand in the review and then had the possibility to incorporate the received feedback into their own papers (Fig. 3 shows the whole process). This phase of revision was very much appreciated by the students and turned out to improve quality of the papers considerably. A number of papers that were seen

[1] Readers can find the bespoken peer reviewing instructions in German language at http://download.idv.edu/crossteaching/PR_Anleitung.pdf.

as average or even below average by the reviewers and the teachers, benefited enormously and at the end of semester met the criteria to be published in the conference proceedings. Not least because of students' wishes, only the final papers were marked by the teachers and the first drafts were not considered.

5 Evaluation and Findings

5.1 Students' Survey

In this section we want to discuss some findings of the qualitative evaluation we have conducted with the students of the winter term 2015/16. The survey consisted of free text questions regarding the process of group work, communication media, situations of conflict and their solutions, scientific paper as learning method, evaluation of Peer Review and collaboration amongst others.

The students were given a free choice of tools and technologies that they could use to communicate with their respective group members. The learning management system 'Moodle' was compulsory for students and was utilised during consolidation of groups and research topics and Q&A regarding issues of general interest. The video conferencing tool 'Adobe Connect' was used for getting in touch with the lecturers. Apart from these two, a diverse variety of tools was used for various purposes.

With the exception of one group (a group of just two students from one university), everybody used Skype; mostly for video telephony and giving their colleagues a face, some groups also used it for file transfer and screen sharing. 10 out of 12 groups used classic e-mail messaging for cooperation, especially for making first contact and finding meeting dates. The actual writing work was commonly done with Google Docs (7 groups) or Microsoft OneDrive (2 groups). A great part of the communication took place via Facebook Messenger (5 groups) or WhatsApp (3 groups), more rarely via Trello or Google Hangout. Taken as a whole the number of tools (besides Moodle and Adobe Connect) utilised by the respective groups ranged between 2 and 6.

All 12 groups stated that the Peer Review was very helpful and that the comments received by their colleagues gave them valuable input for further work on their papers. In addition, the task of actively addressing other groups' papers was seen positively both for the individual learning progress and further improvement of one's own research. The following quotations show the prevailing mood:

> *"The Peer Review process was a very special experience, because the feedback of our colleagues was extremely honest, comprehensive and inspiring."; "Drafting a Peer Review and the associated intensive work with another groups' paper was very interesting and rewarding."*

Quite diverse approaches, perspectives and strategies of the working groups' members turned out to be both challenging and beneficial for the writing process. It seems logical that a collaboration of highly divergent personalities cannot always be without any frictions. However, there were only two groups facing serious problems. Interestingly enough, the end results of these two groups emerged above-average.

> *"Various approaches and educational background of group members were absolutely beneficial. That way, we had a great mix of ideas, methods and strengths, that we could co-ordinate*

and distribute the diverse tasks accordingly."; "Just like in professional life, you can't always choose with whom you want to work together and you might come across difficult characters or people you can't get along very well."

The applied teaching method was seen as positive or very positive by all 12 groups, they all recommend to continue the collaboration. Some groups found the amount of work involved in the process rather high, but the incentive of being able to publish a scientific article during the Master study made it worth the effort.

"The conference provided a worthy setting to our paper and gave it and our efforts a deeper sense."; "I would prefer this learning method to other methods like exams or tests any time, because the knowledge acquired will last longer and seems more meaningful".

5.2 Lining up with Previous Semesters

The present study is part of an ongoing interuniversity teaching and research project that started in fall 2010 [13]. More than 770 students participated in an online survey, 325 of them collaborated in virtual teams which were part of an interuniversity learning scenario; most of them worked on a case study in interuniversity learning groups. 34 students took part in the inquiry-based interuniversity learning scenario, the response rate of the online survey was 47% (N = 16). The students rated the usefulness of communication media which they used for the virtual learning group (Fig. 4). Over the time face-to-face is the preferred media, chat and forum become less important, social media and video conference gain more importance. For the paper collaboration the students preferred shared spaces like Google Docs or Dropbox (3.9 of 4).

In our survey the students ranked different aspects of Peer Review as a learning method on a scale from poor to excellent (see Fig. 5). The highest rank has Peer Review for improving assessment skills. They agreed to Peer Review in general and as learning method (3.4 of 4). Regarding to the learning scenario the personal learning

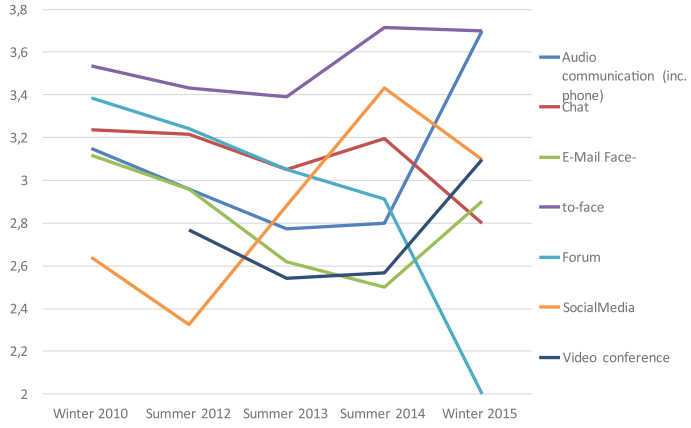

Fig. 4. Rating of media for collaboration [1] not useful, [4] very useful

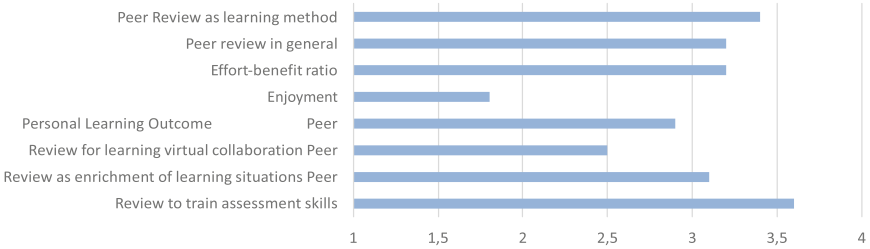

Fig. 5. Student rating of Peer Review as a learning method [1] poor, [4] excellent

outcome, the effort-benefit ratio and the enrichment of learning situations is rated high by the students. The enjoyment was rated lower.

In our model of inquiry based learning the feedback loops are an important part of the learning process. In the survey we asked the students which role the feedback had for their learning process. Figure 6 shows the rating of the students separated by gender, female student rated mostly higher. They see their given feedback as positive and constructive as well as helpful for their colleagues and it encourages their own learning process. The received feedback was positive and constructive as well as helpful. The feedback as contribution to the learning process is not that important. Furthermore, the received feedback didn´t change the focus of the paper or brought new ideas.

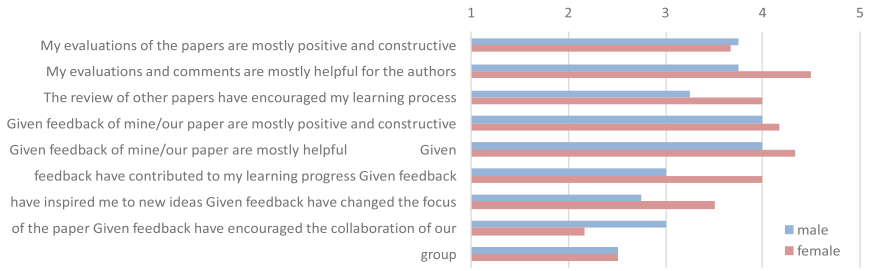

Fig. 6. Student rating of Peer Review feedback [1] totally disagree, [5] totally agree

5.3 Findings and Future Work

In addition to the evaluation results discussed in the previous sections, one of this work's main findings is the tested and refined process model for conducting an interdisciplinary, inter-university collaboration-based course that makes extensive use of research-based learning and embeds an elaborate peer reviewing process. The learning method was very well received by the students, as the following quotation shows:

> *"Even though the development of this paper was more demanding than any other during my studies, I would recommend the cooperation with the university in Magdeburg for the coming years. Not only have we gained another experience, it was very interesting to see that in some cases students of another university have completely different approaches. The chance to present our paper at the Cross Media conference was great and will not repeat itself too*

quickly. The work in virtual teams was rewarding, even though not always simple, and might turn out helpful in modern professional environments."

The learning scenario turned out to be quite demanding for both students and teachers and calls for intense support and coordination. However, the outcome with 6 out of 12 papers being published in the conference proceedings shows that the efforts invested are worthwhile. The discussed process model will therefore be employed again in the next academic year and be evaluated comparatively.

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