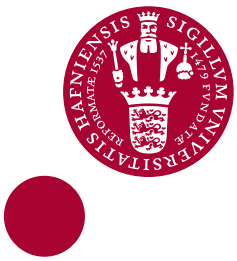

Building a collaborative learning environment with the aid of new technologies

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7

Building a collaborative learning environment with the aid of new technologies

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Summary. This pedagogical exercise focuses on the role of new technologies for aiding collaborative learning and students' engagement. Under the general goal of well aligned courses, new technologies can be useful for aiding engagement through well designed teaching activities, being a tool for supporting different ways of student participation in the classroom. From this approach, the role of new technologies is examined for the implementation of those activities, which are specifically designed for motivating and activating a collaborative learning process in the classroom. It is proposed that, irrespective of using traditional or new technologies, *inquiry*, *reflection* and *discussion* are key concepts for a successful implementation of engaging teaching activities. *Keywords*: engagement, motivation, active learning, inquiry, reflection, discussion

Building a collaborative learning environment with the aid of new technologies

The construction of new knowledge in the classroom, for its implementation in the multiple contexts of real life situations, requires an active and deep learning process (Dolin, 2015). It involves students' engagement and collective collaboration (in small groups or in one big group) in the learning activities, while demanding an individual effort to reflect on previous knowledge. Students need time to absorb all the new information and place it together with their own knowledge, giving form to a deeper understanding of concepts, tools and skills. In this way, engagement requires both active learning and motivation (Barkley, 2009), where *inquiry*, *reflection* and

discussion are closely interrelated, allowing active thinking and communication, under the basic premise that to *think is to try to solve a problem*.

Focusing on how students can be encouraged to participate in teaching activities (TAs), the design of inviting and motivating TAs is an important issue. Firstly, TAs should aid students into achieving an integrated understanding of new knowledge, allowing their engagement and following their performance along the learning process. Secondly, TAs should be designed so that students feel that they are valued members of the group's learning process, where they can actively participate and be included in the generation of knowledge. Hence, by appropriate "hands-on" and "minds-on" activities, students can work together with peers while developing and transforming their own abilities for the acquisition of specific research and reasoning skills.

In this approach, TAs are examined together with collaborative learning, presenting an open problem to the whole group of students in the classroom (as one big group), that requires all their attention. The problem is proposed by the teacher, which here consists in an economic experiment game for making optimal decisions under uncertainty. The problem is a simulated situation that occurs in real life, where students have to play specific roles as if they were buyers or sellers, or bidders. Hence, this sort of teaching activities should motivate students to use (course-specific) economic concepts, together with the knowledge being generated in the activity itself, and propose analytical or intuitive solutions leading to the transformation of their previous knowledge. Hence, as it is proposed here, such a transformation unravels along the basic constructive pillars of inquiry, reflection and discussion.

The purpose of this paper is to examine the use of new technologies for the implementation of *engaging* TAs, regarding the way that different attitudes towards participation and learning can be guided into a collaborative learning process. Therefore, new technologies can be used to support an *easy-access* participatory environment, transforming the classroom into a dynamic scenario where students can easily participate, being motivated by a well-designed activity where different viewpoints are considered and active thinking develops together with peers. In consequence, a basic problem to be addressed here consists in evaluating the appropriateness, advantages and disadvantages, of using new technologies for building a collaborative learning environment in the classroom. Thus, we will examine some teaching situations where traditional and new technologies are used to support students' participation for new knowledge acquisition.

In order to discuss the use of new technologies in the implementation of TAs, a couple of teaching sessions have been designed. A first session develops on traditional technologies, i.e. face-to-face communication, while a second one makes intensive use of new technologies through a completely online activity, i.e., interaction is aided by the online system. After presenting the overall results comparing both sessions, a discussion will follow on the role of new technologies for achieving a collaborative learning environment inside the classroom.

Method

Participants

The participants for this pedagogical exercise were the students for the course Contracts and Cooperatives, which is part of the MSc programmes in Agricultural Economics, Agricultural Development, and Sustainable Development in Agriculture at the Faculty of Science, University of Copenhagen. In total there were 27 students enrolled, all of them with previous knowledge on basic microeconomic concepts, and the activities were implemented with the same group of students for both sessions.

Materials and Procedure

For the implementation of the TAs, traditional technologies consist in verbal communication, pen, paper, and the blackboard. Regarding new technologies, they are studied by means of the online Veconlab Virginia University webpage http://veconlab.econ.virginia.edu/, where students participate through their electronic devices like smartphones, laptops, etc., following the economic games setup from Holt, 2007.

The proposed activities require that students reflect and make inquiries on how they can solve specific decision problems under uncertainty. The problems are presented like an economic game, which can be repeated for a finite number of times. After each repetition, students should reflect on the outcome of the game, and discuss among them and with the teacher about the strategies and reasons for their behavior. The teacher then guides the discussion towards the relevant concepts, allowing students to engage while developing their own deep learning process. In this way, the proposed methodology for implementing TAs under a collaborative environment requires students to question themselves, search for answers, reflect,

and discuss the way the problem can be solved. Under this setting, the use of technologies is examined by comparing the outcome of two types of activities, one making use of traditional technologies and the other making use of new technologies.

Activity with traditional technologies. Here students come up to the blackboard. Two of them play the role of car dealers and the rest of them play the role of car owners that want to sell their car at the highest possible value. Owners know the (good or bad) quality of their car by taking a random piece of paper with the description, which has been previously prepared by the teacher. Dealers ignore the quality of the cars, but desire to attract all the good cars while maximizing their profit. For doing so, they post their buying price on the blackboard and wait for sellers to come and make the trade. They can negotiate a different price, after watching the competition and negotiating with the car owners. The winner is the dealer with highest profit, and the game is repeatedly played with different car dealers.

Activity with new technologies. Here students connect directly to http://veconlab.econ.virginia.edu/cv/cv.php through their laptops or smartphones. The teacher has previously prepared the session, setting up the parameters for the specific auction procedure where students play the role of bidders. They login to the session and start reading the instructions on the online platform. First they read a general description of the basic concepts. Then they study some examples of the bidding mechanism, followed by a more detailed description of the auction procedure in which they will be participating. In the next step, they are asked a couple of questions, revising if they understood the procedure, and they are allowed to continue or go back if they need to revise key concepts. Finally a summary of the instructions is given, and the common value auction begins, interacting between them in pairs through the online platform, but ignoring precisely whom they are being matched up with.

Results

The first traditional activity required face-to-face interactive communication among students. All of them participated. This type of activity was very entertaining to see as it developed, as students felt more and more comfortable in communicating their ideas as the game continued. Knowledge was being actively generated, as dealers shouted the prices trying to

attract more sellers of good cars. Some of them failed, either because they didn't attract sellers, or because they incurred into losses for buying only bad cars (illustrating the point of the theory), while others succeeded, attracting good cars and making a profit. A final winner was identified and a general discussion followed.

This activity succeeded at opening a sort of participation window in the classroom space, making it *natural* for students to pop in their own reflections and questions throughout the game activity and the following discussion. Students were highly motivated, which was very helpful for engaging students in discussing the relevant concepts for the course content.

On the other hand, the new technologies' activity had also total participation, verified by the teacher through the online platform, which allowed controlling the students' actions and address any possible doubts or problems that students could have. After the online bidding, the teacher focused on discussing the results, aiming at building together with students a collaborative environment in the classroom. The discussion grew from reflecting on the online activity and discussing the students' behavior in the game, pointing at the new concepts that were going to be formally treated afterwards in the course.

Supporting the discussion inside the classroom, the online game-activity was summarized by the same online platform, representing the students' actual behavior and how they solved the theoretical open problem of dealing with imperfect information (under the game setting, replicating the natural conditions of real life situations). That is, while students behaved as bidders, they had to make decisions based only on signals about the real value of the commodity that was going to be traded. All their actions were recorded by the system as they played, and after the bidding ended and the general reflection and discussion started, the online platform offered a new dimension to the learning environment, as the group became easily aware of their decisions by seeing them represented in the screen. This summarization of the activity motivated students to participate and comment on their own input for the generation of knowledge in the classroom. In this way, the online activity supported the discussion based on the students' actual experience, representing their knowledge, and even motivating them by presenting their own personal effort in undertaking a deep learning process.

Discussion

Based on deep-learning pedagogy concepts (Dolin, 2015; Entwistle, 2009), the whole system approach (Biggs and Tang, 2012) to the constructive alignment of a course enables a satisfactory learning and teaching experience. From this perspective, courses need to follow an optimal and fair design, allowing students to understand and achieve the intended learning outcomes (ILOs) and develop the relevant competences.

Overall, a well aligned course should have the ILOs coherently stated with respect to the TAs and the assessment tasks (ATs). For the TAs under study, the ILOs were the following,

- Describe the different problems arising from asymmetric information
- Reflect on theoretical and practical solutions for handling asymmetries in information

The problem arising from asymmetric information in the first activity referred to the dealer attracting only bad cars, being there adverse selection. In the second activity, it referred to winning the bid while incurring into losses, due to ignorance on the actual true value of the bid. Then, it becomes evident that the activities were designed to introduce the concept of asymmetric information, by posing an open problem where students needed to handle the uncertainty (*asymmetries of information*) of the simulated situations and arrive at solutions based on their own reflection and inquiry. The discussion following the role-play activities focused in examining their own solutions, and comparing them with the theoretical optimal solution.

In this sense, the discussion of the activities through the knowledge that was generated by students themselves was a very important (validation) phase in the deep and collaborative learning process. As their actions were recorded, either by their own written records and oral participation or by the online application, students could actually notice their inclusion in the group's learning process. In this way, the success of the TAs depended on having students participate and feel included in the generation of new knowledge, supporting the whole group discussion by their actual behavior in the game.

In the traditional activity, the blackboard functioned as a window for participating and building knowledge, as a tool bringing together the attention of students, like the common ground for materializing the knowledge being generated by everyone inside the classroom. So, what could be expected from the use of new technologies is nothing else than to bring into

the classroom an open and easy access *blackboard* for everyone, sharing knowledge in the online platform and representing that knowledge for everyone to analyze (as opposed to the individual control sheets of the traditional activity which remain hidden unless the teacher summarizes them, with the respective time consuming effort which may be enough to lose the students' attention). In this way, although technologies may facilitate the representation of knowledge, building a collaborative environment inside the classroom does not depend solely on using new or traditional technologies, but rather on using the knowledge being generated by everyone in the activity through interesting and engaging discussions.

Thus, technological support can be useful for having active and open interaction with students, allowing them to discuss the activity's results by relating to an online platform that instantaneously represents everyone's knowledge. In this sense, new technologies may enhance the means for knowledge representation, aiding the emergence of a healthy dynamic among teaching and expectations, but stressing that they still require the appropriate framework for their successful implementation. Under this approach, it is proposed that the key pedagogical concepts for undertaking engaging activities consist in inquiry, reflection and discussion.

From a constructivist view (see e.g. Dolin, 2015), the individual learns by interacting with the surroundings, through the active and conscious activation of perception. Thus, the learning process develops from interpretation, reflection and adaptation, where the personal and structured view of the world has to somehow make room for new knowledge. Hence, new concepts have to be formed and reshaped, together with a deep understanding of scientific tools and skills for problem solving under multiple contexts. In this way, constructivism suggests a deep relation between inquiry and reflection. It can be conceived as a process of controlled reasoning of concepts through introspection and serious thought, attaining and transforming knowledge for problem-solving purposes. Besides the two learning dimensions of *inquiry* and *reflection*, a third one is included for representing the construction of knowledge in the classroom, referring to the interaction with peers (and the teacher) through the *discussion* of the relevant/new conceptual tools and skills. This last dimension allows students to verify and validate their (ongoing) comprehension of ILOs and competences.

As a final note, it should be expected that under a collaborative environment, students would find it easier to think and express their own take on reality, as opposed to having only introspective/theoretical exercises (which come with an important dose of artificiality and are commonly used by

the teacher) to introduce and learn the new concepts. Furthermore, discussion leads to understanding the state of things together with peers, and to think about concepts and their meaning, motivating students through the social component of learning. Hence, deep and active learning should be more likely to occur in collaborative environments, where students bring themselves the questions on the artificiality of the classroom activities and reflect on how it would be in the real life. Therefore, traditional teaching could be enhanced not only by an adequate use of new technologies, but also by problem-solving activities, like open ill-framed problems (real-world situations that require bringing together both new and old knowledge) that (somehow) replicate real-life cases, supporting the deep and individual/social learning effort of students in well aligned courses. As it stands, the examination of these ideas on the relationship between problem solving, deep learning, motivation and new technologies, is left for future research.

Conclusions

The pedagogical exercise examined in this paper develops around the construction of new knowledge in the classroom by motivating an active and deep learning process through well designed TAs. Furthermore, the role of new technologies was explored for supporting TAs, aiming at engaging students into a collective learning collaboration. In this way, inquiry, reflection and discussion were identified as key concepts, allowing active thinking and communication for generating knowledge through interesting and engaging TAs.

In the particular situations analyzed in this exercise, it was more difficult to represent the participants' knowledge in a traditional setting, as oral negotiation took place, and the individual results were gathered in a piece of paper (the dealers' control sheets) that had to be later summarized in order to identify the winner. This summarization task was time consuming, on the contrary to new technologies, where the participants' knowledge was automatically represented for everyone to see and discuss around it.

Nonetheless, there are important risks on the use of new technologies, as they do not assure the successful implementation of TAs all by themselves. In this sense, this exercise is intended as a conscious reflection on the necessary aspects to be considered for implementing engaging TAs,

while making efficient (and desirable) use of new technologies in the classroom.

For future research, problem-solving activities could be examined together with economic games, exploring the relationship between deep learning, motivation and technological support for the successful implementation of inquiry-based learning (see e.g. Edelson, Gordin, and Pea, 1999).

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Contents