A PLEA FOR CONNECTING DISCUSSION AND QUESTIONS TO THE COURSE MATERIAL

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ABSTRACT

Virtual learning environments offer a plethora of possibilities for discussion and Q&A (questions and answers). These discussions and questions are however most often placed in a "silo" separated from the actual course material. As a result, the discussion and questions are both from the perspective of the students and the teacher seen as separate entities. Connecting the discussion and Q&A to the actual course material (handbook, slides, solutions of exercises) opens up interesting opportunities: students can immediately see a discussion that digs deeper on the course material, or can see a clarification provided by the teacher or a peer student. But does the connection between discussion and Q&A and the course material also come at a cost? What platforms offer such connections?

This paper presents an analysis of the pros and cons of connecting discussion and Q&A to course material in interactive courseware platforms to create online learning communities. This analysis is based on desk-research and on case studies in three engineering courses where the Q&A around the model solution of the exam or the discussion on course material was placed on an interactive courseware platform in two different platforms, Perusall and Nextbook, allowing social annotation and discussion directly on the course material.

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1   INTRODUCTION, THEORETICAL UNDERPINNING AND CONTEXT

Social constructivism is a sociological theory in educational sciences that states that knowledge is constructed through interaction with others and that human development in general is socially situated [1]. This is supported by different researches that found that students' understanding of material is higher when it has been subject of discussion with others. While active discussion is related to better understanding according to social constructivism and has also shown to be related to higher academic achievement [2], a high proportion of the students does not access or post to online discussion platforms [2]. Any measure that results in a higher participation of students to the online discussion is therefore promising. The specific idea explored in this paper is to connect the discussion directly to the courseware, i.e. to augment the course material with a discussion functionality. Such courseware is often referred to as **interactive courseware:** course material augmented with interactive elements that allow users to interact with the course material (e.g. highlighting, commenting, editing, liking) or with other users in the context of social learning (e.g. discussing, asking questions). **Online learning communities**, a more general perspective than interactive courseware, refer to virtual learning platforms where social learning communities can be built and therefore provide an environment where learners and teachers can build knowledge interactively or collaboratively. Moreover, online learning communities can stimulate help-seeking and help-providing behavior of students.

Discussion is one of the most widely used aspects in online learning communities. Newer educational technology provides new social learning features such as online annotation and joint reading. Miller et al. [3] provide a nice overview of studies showing that social annotation increases student learning across many different education settings. Moreover, they add evidence themselves on the increased academic achievement in a course supported by the social annotation platform Perusall.

A particular opportunity of online learning communities and interactive courseware is that they accommodate for **asynchronous social learning**: online discussion fora for instance allow users to post questions, engage in a discussion, or reply to questions at any time and from any place. This asynchronicity has proven to be a particular supportive feature in the fully online or blended modus of teaching and learning that higher education institutions were forced in due to covid-19 in 2020 and 2021.

This paper focuses on three exploratory cases of the introduction of interactive courseware to help connect discussion and Q&A to course material. The cases were executed at KU Leuven in Flanders, Belgium. KU Leuven is a highly ranked research-intensive university both regarding research and education. The three courses discussed in this paper are a first-year bachelor course in engineering mechanics (Applied Mechanics, part 1), a second-year bachelor course in engineering mechanics (Applied Mechanics, part 3 regarding matrix- and vector methods for three dimensional kinematics and statics), and a master after master course in artificial intelligence (Uncertainty in Artificial Intelligence). Applied Mechanics, part 1 is a course with around 700 engineering and engineering architecture students, with a low success rate (around 40%). Applied Mechanics,

part 3 is a course with a small number of students, this year 12 students with a medium success rate (60%). Uncertainty in Artificial Intelligence is a medium-size course (250 students) with high success rate (85%).

In this paper we will discuss the platforms used and the implementation of the social interaction in three courses (Section 2), present our findings from the three cases together with three recommendations (Section 3), and a conclusion (Section 4).

2   PLATFORMS AND IMPLEMENTATION

In the context of the Erasmus+ project Co-created Interactive Courseware (CiC), we explore the new interactive courseware platform Nextbook (www.nextbook.be) and develop pedagogical use cases, teachers guides, and learning analytics to support the use of interactive courseware on Nextbook and in general. In this paper we present our first experiences of using two platforms for interactive courseware to support asynchronous discussion directly connected to the courseware.

Beside the new platform Nextbook, a main actor in the CiC project, we used the longer existing and already established Perusall platform (https://perusall.com/). Below we shortly discuss the platforms and show how the platforms were used in our case studies.

Figure 1: Example of Learning Pathway offered in Toledo, a blackboard-based Virtual Learning Environment, for Applied mechanics, part 3.

2.1.1   Perusall

Perusall (https://perusall.com/) is a free, online platform for "social reading" of textbooks. Teachers create an online course on Perusall and can populate the library of that course with their material (books from the Perusall catalog, web pages, own textbooks or documents, video or podcasts). Next, teachers create assignments on

the material in the library, with optional deadlines, grading, and anonymization. In the assignments, students can asynchronously ask or answer questions, comment, or discuss on the material connected to the assignment. To this end they select a particular text, formula, or picture and start a chat. Other students can see the question or comment, upvote it, or respond to it. Perusall offers Learning Tools Interoperability (LTI) integration, allowing it to integrate easily with most Virtual Learning Environments.

Perusall has been the subject of different scientific studies, which indicated that use of Perusall in flipped teaching is linked to higher academic achievement [3], increases social interactions during the course and peer-to-peer interactions in particular [4], and that automated scoring of interactions offered by Perusall is perceived positively by students and is similar to teacher scores [5].

2.1.2   Blended and flipped course with Perusall

Perusall was introduced in the course Applied Mechanics, part 3 in the second semester of academic year 2020-2021, when the university was forced to offer fully online education due to the covid-19 pandemic. The course uses a flipped teaching format where each four-hour long teaching slot is preceded by a flipped teaching task. The course was constructed using learning pathways in Toledo, the blackboard-based Virtual Learning Environment of the university (Figure 1).

Figure 2: Perusall at work as a platform to ask questions during a blended and flipped course.

The flipped teaching task consisted of two or three short theoretical videos, reading of the textbook sections connected to these videos, and the solving of an exercise. Students could ask questions or start a discussion while preparing as the material was, besides being available on the Virtual Learning Environment, also made available in Perusall (Figure 2). The four-hour long teaching slot was started with an online "check-in" session in Microsoft Teams, where the teacher explained the "big
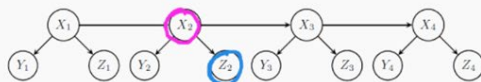
picture" and the goals of the interactive session and then proceeded with answering the questions that students asked in Perusall or that they asked during the check-in. The remaining time of the four-hour teaching slot consisted of four slots with each 45 minutes independent work of the students, where they follow the learning pathway and in the meanwhile can ask discussion in Perusall, and around 10 minute-long interactive video calls in Microsoft Teams where questions were answered and progress was discussed.

Figure 3: Nextbook at work to ask questions on the model solution of the exam to prepare for the Q&A session after the exam.

2.1.3 Nextbook

Nextbook (http://nextbook.be) is a free, online platform for "social reading" of textbooks, which envisions social construction (co-creation) in the future. Teachers can upload their textbook, augmented with video, 3D models, quizzes, etc. This augmented textbook immediately serves as a basis for social learning. Nextbook offers flexible reading on any platform as the book is transformed using web technology offering automatic scaling, free choice of font and text size, dark mode, etc. It also has functionality for reading out loud, a nice supplement on top of a dyslexia-friendly font for students with reading disabilities or challenges. Students can use highlights to mark important parts and even generate automatic summaries from these highlights. They can also add personal notes for later reference. From the social interaction point of view, they can select part of the text, image, formulate, … and start a discussion from this or ask a question. Questions or comments can be responded to in a chat-like manner and liked (up-voted).

2.1.4 Q&A after exam with Nextbook

In the courses of Applied Mechanics, part 1 and Uncertainty in Artificial Intelligence a Q&A opportunity is offered to student as part of the feedback after the exam of the course. To this end, for both courses the model solution for the exam was uploaded on Nextbook such that students could directly ask questions on this model solution. In the case of Uncertainty in Artificial Intelligence this was the preparation for an online live Q&A session where the teachers would more elaborately respond to the questions of students. Figure 3 shows a view of one of the exam questions and a question of a student, and the response of a teacher.

3 FINDINGS

We discuss the findings below using four categories: use and social learning, seeing discussion while learning, integration with the virtual learning environment, and overview for the teacher. For each category we present a recommendation.

3.1 Use and social learning

From the **teacher-perspective** both Perusall and Nextbook are rather user-friendly tools. Perusall relies on assignments, which makes it more time-consuming to configure. Nextbook on the other hand only requires the uploading of the course material and is then ready to go. From the **student-perspective** Nextbook appears to be more up to date than Perusall and Nextbook seems more intuitive to immediately start a chat. Neither platform triggered questions of students on how to use them.

Actual adoption of the platform for asking questions and initiating discussion was very disappointing in all three cases. For Applied Mechanics, part 3 (Perusall) students asked few questions anyway: both in the Perusall platform and in the live online video calls. If questions were asked, no other students interacted with the question (answering of upvoting). For Applied Mechanics, part 1 (Nextbook) only a minority of the students even entered the Nextbook platform, possibly because they could already see the model solution during the on-campus exam feedback and in a pdf in the Virtual Learning Environment. Therefore, the only reason to open the model solution was to ask any remaining questions. Moreover, as was also the case in the other course, students were already using the discussion forum from the Virtual Learning Environment as a discussion tool to which they were accustomed in the meanwhile. For Uncertainty in Artificial Intelligence (Nextbook), more students entered the Nextbook platform as this was the only way to see the model solution. From these students however, again a minority took the opportunity to ask a question, and these questions were not interacted with by the other students (upvoting, responding).

From our three cases we can only learn that social interaction connected to course material is no free lunch: it does not happen spontaneously especially if it is not offered throughout the entire course.

Our recommendation is that the pedagogical approach should focus on integrating the interactive courseware from the beginning of the course and stimulating the discussion in the platform.

3.2 Seeing discussion while learning

A potential advantage of the interactive courseware is that students can immediately see the discussion or other students' questions and (teacher) responses while studying the material. We were not able to harvest this potential advantage in our cases as in two courses the material was just the model solution of the exam, and for the other case the material was duplicated on the Virtual Learning Environment in the learning pathway. This choice was made in order to keep the learning material (and hereby also students) in the learning pathway (Figure 1) as much as possible. Therefore, students were only directed to Perusall in case of questions. We observed that students that do not have questions do not enter Perusall to browse for other students' questions and possible (teacher) replies.

Our recommendation is that the learning material should be natively offered in the interactive courseware platform, rather than being a duplicate from the material already offered on the Virtual Learning Environment. Otherwise, students will lack the social dimension while studying the material.

3.3 Integration with the virtual learning environment

Both Perusall and Nextbook are easy to integrate with the Virtual Learning Environment over LTI-integration, which allows the student to navigate from the Virtual Learning Environment to the Perusall and Nextbook environment using a simple link without requiring a new login (after the registration and login was done once). This click-through however causes students, both in the case of Perusall and Nextbook, to leave the Virtual Learning Environment and enter the social learning environment. This is seamless, but still an additional click and a potential point to ""lose"" the student.

Our recommendation is that the pedagogical approach and the interactive courseware platforms should be better integrated with the Virtual Learning Environments. Rather than redirecting students entirely the external platforms, the interactive elements should be part of the other learning elements in the Virtual Learning Environment, allowing teachers to compose learning pathways that blend together different types of didactical elements (interactive courseware, quiz, assignment, peer feedback, etc.).

3.4 Overview for teacher

A particular advantage of both Perusall and Nextbook is the "overview" of the discussion that is directly connected to the course material. This is a clear advantage over traditional discussion fora where this overview is typically lost. The overview comes in particularly handy when preparing for a Q&A session in the context of flipped-teaching or exam feedback. Moreover, when improving the course material for the next semester or academic year, it is easier to browse through the material

and immediately see the intensively discussed parts, which for instance potentially require clarification or elaboration.

Our recommendation is to use interactive courseware platforms to increase the surveyability and structure of students' questions and discussions, supporting preparation of interactive Q&A sessions and discussions, and future improvements of course materials.

4 CONCLUSION

Interactive courseware has a large potential considering the theory of social-constructivisms and the available research evidence presenting a link between higher social engagement and academic achievement. The cases in this paper however show that despite that potential, the gains of interactive courseware platforms do not come easily. To realize its potential the interactive courseware must be well-integrated with the main Virtual Learning Environment and the learning material should not be duplicated to prevent students from missing out the social dimension of the discussion and questions and answers. The free lunch that comes along with the interactive courseware is the increased surveyability and structure of students' questions and discussions supporting teachers in preparing their (flipped) teaching interactions and improving their teaching materials.

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REFERENCES

[1] Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Cambridge, MA: Cambridge University Press.

[2] Nandi, D., Hamilton, M., Harland, L, and Warburton, G. (2011). How active are students in online discussion forums? In Proceedings of the Thirteenth Australasian Computing Education Conference - Volume 114 (ACE '11). Australian Computer Society, Inc., AUS, 125–134.

[3] Miller, K, Lukoff, King, G., Mazur, E. (2018). Use of a Social Annotation Platform for Pre-Class Reading Assignments in a Flipped Introductory Physics Class. Frontiers in Education (3), doi:10.3389/feduc.2018.00008

[4] Adams, B., & Wilson, N. S. (2020). Building Community in Asynchronous Online Higher Education Courses Through Collaborative Annotation. Journal of Educational Technology Systems, 49(2), 250–261. https://doi.org/10.1177/0047239520946422

[5] Cecchinato, G., & Foschi, L. C. (2020). Perusall: University learning-teaching innovation employing social annotation and machine learning. Qwerty: Open and Interdisciplinary Journal of Technology, Culture and Education, 15(2).