Online active learning

ONLINE ACTIVE LEARNING: A COMPARISON OF THREE VIRTUAL CLASSROOM COLLABORATIVE LEARNING SCENARIOS (PREPRINT)

J. Janssen, I. Wopereis, P. Swennenhuis, P. Ebus, H. Severeyns-Wijenbergh, J. van Wijnen

Open University of the Netherlands (NETHERLANDS)

Abstract

Although virtual classroom (videoconferencing) technology has developed into full maturity, from a pedagogical perspective its deployment in higher online education is still rather limited in terms of interactivity and student-centred learning designs. Whereas current virtual classroom functionalities support the use of a plethora of collaborative learning techniques, teachers appear reluctant in exploring them. We describe the development, implementation and evaluation of three didactical scenarios for collaborative learning in the virtual classroom: case-based learning, project-based learning and problem-based learning. The scenarios were developed building on existing initiatives in three different fields (Law, Science, and Educational Sciences). The three scenarios involve a variety of online collaborative learning activities in parallel groups of various sizes. The scenarios have been evaluated with students through online questionnaires and in focus groups, drawing on the Group Learning Activities Instructional Design framework. Results indicate high satisfaction levels across the scenarios regarding the technology used (virtual classroom as well as its communication tools). Satisfaction regarding collaborative activities varied, depending on duration (i.e., size) of the group learning task and related feedback needs.

Keywords: Online active learning, virtual classroom, collaborative learning.

1 INTRODUCTION

Until recently the Open University of the Netherlands (OUNL) provided distance education best characterized as guided self-study in which students largely determine the time, place, and pace at which they learn. Needless to say, such high flexibility comes at the expense of retention. In an attempt to improve student retention, a new educational approach of active online learning, was adopted. Unlike before, most courses now have fixed start moments, both for practical (e.g., facilitate planning) and pedagogical (e.g., enable collaborative learning designs through cohorts) reasons.

This new approach already has appeared to bear fruit in terms of enhanced retention figures [1]. However, student course evaluations make clear that opportunities for synchronous online education in virtual classrooms (VCs) –created by the cohort approach– are not optimally exploited. To the extent that VCs are being used, they tend to focus on information transfer and direct instruction, rather than active learning and interaction. Teachers are aware of the opportunities, but express a need for support in creating more (inter)active designs. The design of collaborative learning activities requires specific knowledge and skills [2]. This paper describes preliminary results of design-based research geared towards the development, implementation, and evaluation of three collaborative learning scenarios in the VC, with the further aim to develop exemplary models to support teachers in deploying these scenarios. Research questions addressed in this paper are: (a) to what extent do students appreciate small group collaborations in the VC (RQ1), (b) how do students evaluate specific characteristics of group learning activities in VCs (RQ2), and (c) do the scenarios show different results (RQ3)?

2 ACTIVE LEARNING AND COLLABORATIVE LEARNING

Active learning implies instructional activities that involve students in doing things as well as in thinking about what they are doing [3]. Thus, active learning enhances development of higher order thinking skills. Collaborative learning is a form of active learning, which can be broadly defined as “two or more students laboring together and sharing the workload equitably as they progress toward intended learning outcomes.” [4, p. 4]. The term covers various forms of collaborations, sharing the following characteristics: (a) intentional, structured, group activities, which (b) address specific learning goals, and (c) require (more or less) equal effort from each group member.

Cite as: Janssen, J., Wopereis, I., Swennenhuis, P., Ebus, P., Severeyns-Wijenbergh, H., & Van Wijnen, J. (2020). Online active learning: A comparison of three virtual classroom collaborative learning scenarios. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI2020 Proceedings: 13th International Conference of Education, Research and Innovation* (pp. 8518-8521). IATED. https://doi.org/10.21125/iceri.2020.1896

Three scenarios for collaborative learning in the VC addressed in this paper are: case-based learning (CBL), problem-based learning (PBL), and project-based learning (PjBL) [5]. These scenarios are alternatively referred to as the interventions in this study.

2.1 Collaborative learning scenarios

The CBL scenario –embedded within an introductory course on private law– included an instructional unit aimed at learning to solve legal cases. The instructional unit included two sets of learning activities, each following the same structure. First, students individually studied a video-based modeling example of experts solving a legal case. Second, in the VC a small group of students solved an authentic legal case supervised by the teacher, while the other students had to discuss the small group's process in a chat (so-called fishbowl technique). Third, students solved a similar case in parallel groups in VC break-out rooms. Note that instructional support gradually diminished as students proceeded (cf. scaffolding [6]). The activities performed in the VC classify as synchronous online learning (SOL) activities.

The PBL scenario –embedded within a bachelor chemistry course– included three instances of SOL activities. The first activity was a multi-step PBL task, where students discussed in small groups stepwise the synthesis of vitamin A. The groups proceeded in the process after a plenary supervised discussion of a specific step (cf. performance constraints [6]). In the second SOL activity, students learned to solve a combined problem. Students were subdivided in two groups. Each group learned about a specific spectroscopy method (i.e., either infrared or nuclear magnetic resonance) and analyzed the structure of an unknown chemical within the subgroup. Subsequently, the chemical was analyzed in a plenary session, requiring input from both groups to arrive at a final solution. The third SOL activity consisted of a discussion on the risks of certain substances. Students (divided in two groups) individually studied theory about one of the substances at home. In the VC, the students first discussed a statement related to the theory in break-out rooms. In a plenary follow-up, students debated the dangers of both substances for society.

The PjBL scenario –embedded in an educational research methods master course– differed from the previous scenarios in that group collaboration extended beyond the confines of the VC and covered the entire course. Groups of four students worked on a project involving the preparation of a research proposal. Within the course four one-hour VC sessions were organized. Each session included (a) plenary feedback on educational research theory and (b) monitoring of project groups in break-out rooms. Students in break-out rooms could work on their project when the teacher was not present in the break-out room.

3 METHOD

Design. This study used a post-test only non-experimental design to determine the value of various collaborative learning-centred VC sessions that are part of online undergraduate and graduate courses. Data were collected by means of polling at the end of each session and a post-intervention questionnaire. The study was part of a design-based research (DBR) project and informed the redesign of sessions. DBR typically involves multiple, iterative cycles of design and implementation, in which each implementation is used to collect data with a view on improving the design [7]. The didactical scenarios developed in the current study built on existing instructional formats in three different educational contexts. Additional cycles of redesign and the (final) implementation of the scenarios resulted in exemplary models that aim to support teachers seeking to incorporate synchronous collaborative learning in their online courses.

Participants. Participants were (a) undergraduate students Law enrolled in the introductory course on private law (CBL scenario), (b) undergraduate students Science enrolled in a chemistry course (PBL scenario), and (c) graduate students Educational Sciences (master's level) who followed a course on research methods (PjBL scenario). Since participation in VC sessions was voluntary, the number of students participating in the polling varied (CBL scenario: $47 < n < 58$; PBL scenario: $7 < n < 12$; PjBL scenario: $44 < n < 48$). The same applied to the post-intervention questionnaire. Twenty Law students and 29 Educational Sciences students filled in the questionnaire. Because only four Science students (PBL scenario) responded to the questionnaire, we did not include these data in the presentation of the results.

Materials. At the end of each VC session a poll was used to inquire to what extent students agreed with the statement 'I learned a lot working on the parallel group assignment'. A brief discussion followed each poll. In addition, specific questions were added to the regular course evaluation questionnaire to

Cite as: Janssen, J., Wopereis, I., Swennenhuis, P., Ebus, P., Severeyns-Wijenbergh, H., & Van Wijnen, J. (2020). Online active learning: A comparison of three virtual classroom collaborative learning scenarios. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI2020 Proceedings: 13th International Conference of Education, Research and Innovation* (pp. 8518-8521). IATED. https://doi.org/10.21125/iceri.2020.1896

investigate student satisfaction (five-point Likert scale ranging from '1 = very dissatisfied' to '5 = very satisfied') with the characteristics identified in the GLAID framework [1], such as interaction and feedback, group composition, and learning environment. An open question was added to enable elaboration on dissatisfactory characteristics.

4 RESULTS

4.1 Evaluation of small group collaboration in VC meetings

Overall, students appear to largely agree they learned a lot from working in parallel groups in break-out rooms during the VC meetings (Mdn = 4). A Kruskal-Wallis H test on the polling data showed that there was no statistically significant difference between the three scenarios ($H(2) = 5.853$, $p = .054$). Variations in mean rank scores (49.94 for PBL, 56.08 for CBL, and 41.58 for PjBL), seem to relate to the fact that students in the PjBL scenario were less content with the twofold purpose of these VC sessions (i.e., content clarification as well as process monitoring), as was clarified during the discussion following the poll.

4.2 Satisfaction regarding GLAID characteristics

Table 1 shows the median score (Mdn) for all GLAID characteristics for the CBL and PjBL scenarios. (PBL not included due to insufficient responses so far). The results indicate that students were satisfied with the design and implementation of most GLAID features in the sessions.

Table 1. Satisfaction with GLAID characteristics in CBL and PjBL scenario (Mdn).

GLAID characteristic	CBL (*n* = 11)	PjBL (*n* = 29)
Interaction geared towards understanding course contents	4	3
Interaction geared towards understanding the activity/ group work process	3	3
Goals of the VC sessions	4	3
Number of VC sessions	2	3.5
Distribution of VC sessions across the course	3	4
Activities carried out during the VC sessions	4	2
Influence on activity	4	3
Dependency on input from others	3	3
Teacher feedback on/during group activity	4	4
Peer feedback on/during group activity	4	4
Communication tools	4	4
Size of parallel groups in break-out rooms	4	4
Group heterogeneity	4	3.5
Duration of collaboration	4	3.5
Virtual class environment	4	4

Characteristics scoring less favourably (Mdn = 2) vary for the CBL and PjBL scenario. In the CBL scenario, students were less satisfied with the number of VC sessions. From the answers to the open question we learned they would like to attend more of such sessions. In the PjBL scenario, students were less satisfied with the activities carried out during the VC. Answers to the open question further confirmed they would like the VC sessions to be entirely dedicated to feedback on their specific project, without additional instruction on content. Teacher feedback, peer feedback, communication tools, group size, and the VC environment show equally high satisfaction levels for both scenarios.

Cite as: Janssen, J., Wopereis, I., Swennenhuis, P., Ebus, P., Severeyns-Wijenbergh, H., & Van Wijnen, J. (2020). Online active learning: A comparison of three virtual classroom collaborative learning scenarios. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI2020 Proceedings: 13th International Conference of Education, Research and Innovation* (pp. 8518-8521). IATED. https://doi.org/10.21125/iceri.2020.1896

5 CONCLUSIONS

Across the three scenarios students clearly value small group collaboration in the VC. Satisfaction levels regarding most instructional design characteristics were similar (i.e., high) in the CBL and the PjBL scenarios. Differences were related to VC content (low satisfaction level in the PjBL scenario) and the preferred number of sessions (should be higher according to students in the CBL scenario). Considering these results, we conclude that the duration of group collaboration, which extends over the entire course in the PjBL scenario, affects student expectations and needs regarding the design of SOL activities. Overall, results seem to confirm that VC technology has reached maturity as both the VC environment and the communication tools it provides are appreciated across scenarios. Results on the evaluation of the GLAID characteristics will be used as input for a subsequent design cycle in the overall DBR project.

ACKNOWLEDGEMENTS

This work was supported by the Dutch Ministry of Education, Culture, and Science (Stimuleringsregeling Open en Online Onderwijs 2018-2022; Grant No: 0019-16).

REFERENCES

[1] K. Schlusmans, R. Van den Munckhof, G. Nielissen, "Active online education: A new educational approach at the Open Universiteit of the Netherlands," in *Proceedings of the Online, Open and Flexible Higher Education Conference* (G. Ubachs & L. Konings eds.), pp.163-176, Maastricht, the Netherlands: EADTU, 2016.

[2] M. de Hei, J.-W. Strijbos, E. Sjoer, W. Admiraal, "Thematic review of approaches to design group learning activities in higher education: The development of a comprehensive framework," *Educational Research Review*, vol. 18, pp.33–45, 2016.

[3] C. C. Bonwell, J. A. Eison, *Active Learning: Creating Excitement in the Classroom*. ASHE-ERIC Higher Education Report, no. 1, San Francisco: Jossey-Bass, 1991.

[4] E. F. Barkley, C. H. Major, K. P. Cross, *Collaborative learning techniques*. 2nd edn., San Francisco: Jossey-Bass, 2014.

[5] J. R. Savery, "Overview of problem-based learning: definitions and distinctions," *Interdisciplinary Journal of Problem-Based Learning*, vol. 1, no. 1, pp.9–20, 2006.

[6] J. J. G. Van Merriënboer, P. A. Kirschner, *Ten Steps to Complex Learning: A Systematic Approach to Four-Component Instructional Design*, 3rd. ed., New York: Routledge, 2018.

[7] D. C. Edelson, "Design Research: What We Learn When We Engage in Design," *Journal of the Learning Sciences*, vol. 11, no. 1, pp.105–121, 2002.

Cite as: Janssen, J., Wopereis, I., Swennenhuis, P., Ebus, P., Severeyns-Wijenbergh, H., & Van Wijnen, J. (2020). Online active learning: A comparison of three virtual classroom collaborative learning scenarios. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI2020 Proceedings: 13th International Conference of Education, Research and Innovation* (pp. 8518-8521). IATED. https://doi.org/10.21125/iceri.2020.1896