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RELEVANT ASSESSMENT AND PEDAGOGIES FOR INCLUSIVE DIGITAL EDUCATION

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REPORT ON ASSESSMENT IN WORK-BASED AND PROJECT-BASED LEARNING

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1. ASSESSMENT IN PBL AND WBL

Assessment guides learning. In line with the principle of constructive alignment (Biggs, 1999), assessment tasks should be aligned with the intended learning outcomes (LOs). Students should be supported by adequate teaching methods and guided learning processes to achieve the goals and LOs, and an assessment programme of a course needs to include students' assessment according to all LOs. Preparing the assessment of LOs of a higher cognitive or practical level is a challenging task.

Project-based learning (PBL) is a complex student-centered approach (Chanpet et al., 2020), which usually begins by presenting knowledge and concepts to students which they need to learn and further explore and broaden through an opportunity to apply knowledge in collaboration with other students, in order to produce a new product, some other artefact or interpretation of some real-world problem (Lin et al., 2021). This means that it incorporates problem-solving activities but includes problem posing, problem solving, collaborative learning, data collection and manipulation as well as presentation of results (Blumenfled et al., 1991; Chang & Tseng, 2011; Divjak, 2015; Lin et al., 2021). *Formative assessment* (FA) is needed throughout the PBL process to support students in achieving results. PBL often occurs under the umbrella of work-based learning (WBL).

Work-based learning (WBL) includes different forms of work placement and internships in companies, but it also takes place in educational settings, and includes simulations, online projects or placements and consulting (Pažur Aničić & Divjak, 2021). Wood et al. (2020) categorized WBL into three main types: 1) conventional WBL that considers relevant work-based experience, 2) simulated WBL that emulates the functions of a workplace with inputs by the workplace and 3) remote WBL that focuses on students completing authentic tasks for an organization through a remote connection. Situated learning often includes communities of practice or communities of learners.

Peer-assessment is a process in which students use qualitative or quantitative grades or ratings to assess performance of their peers, i.e. other students form their class or other groups they belong to.

2. ASSESSMENT MODELS IN PBL AND WBL

Assessment in PBL often incorporates students' work in collaborative projects, which is performed through several stages, followed by FA. The final artefact is assessed in the end. In formative and summative assessment, students often take place as peer-assessors, or perform self-assessment. The final artefact is mostly complex and is assessed according to assessment criteria and/or assessment rubrics. Assessment criteria are usually communicated to the students before the assessment task starts.

For example, in the study by Fontanillas et al. (2016), the development of a collaborative digital project is considered. To undertake it, students form groups of four, and have their own group space which integrates a variety of tools. The research is conducted at a fully online university and in the starting phase students create their teams and perform the initial search in an online environment. In the second (structuring) phase, they make a deeper search for information to structure the project. In the developmental phase, the project is developed and the first vision of the project is achieved. In the last phase, the closing and dissemination, sharing and discussion of the project are performed and the final version of the project is made. Assessment activities are based on continuous assessment and carried out online, but the final

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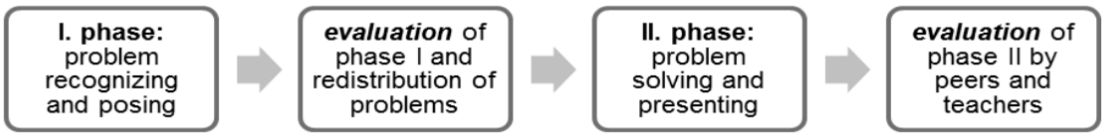
assessment is face-to-face, based on assessment criteria. Students also perform a relevant role in assessment in both formative (project development process assessment and performance of individual students) and summative assessment. They formulated the concept *360° e-assessment* based on *360° communication*, characteristics of which are: strategic, integral, holistic, transversal, coherent and dynamic.

Another example has been described by Divjak and Maretić (2017), who used mathematical modeling of learning analytics and proposed a new metric to measure the reliability of peer-assessment. In their case study, in the Project Management course, e-assessment embedded in Moodle was used for assessment of complex problems and authentic tasks. Peer-assessment was used for essay writing (low stake assessment) and projects (high stake assessment, 30% of the final grade).

Further, Divjak (2015) presented an approach to the assessment of complex, non-structured mathematical problems. In the Discrete Mathematics with Graph Theory course, the learning process included two phases, as presented in the figure below. In the first phase (Problem posing), students identified potential problems, which teachers then analysed and gave feedback. In the second phase (Problem solving), problems were solved in teams and solutions submitted and presented. Final grades were given by the teacher, with students from the team that posed the problem invited to comment. The task contributed to the course grade with 20%, with the 2:3 ratio between phases I and II. Assessment was done according to scoring rubrics.



Chanpet et al. (2020) worked with the hypothesis that PBL relies on FA with ongoing feedback to help learners move through the PBL process to the eventual co-construction of a shared artefact. Conversation and discussion are central to the process. In their model of PBL with FA, at the end of each step, learners submit evidence on their engagement in PBL - prepare a portfolio, organized around 5 folders for 5 steps. In the study, one section of the course was given the option to complete the course online (vs. face-to-face). Assessment and learning were intertwined: learners interacting, collaborating, constructing and creating with shared goals and purposes. They were supported by the instructor's FA and feedback, the PBL framework (including 5 dimensions) and the LMS and e-portfolios. FA was supported by technology: an LMS was constructed with communication (discussion forum, chat rooms, internal e-mail system, transcripts of communication and feedback) and file sharing tools with e-portfolios (dropbox with 5 folders; near the end of each step the PBL, learners were expected to to compile and submit physical and reflective evidence of their engagement); activity reports on students were also available to instructors.

Nunez et al. (2017) analyzed the process of creating a small private online course, including development of new assessment tools. Students performed their assessments in peer-to-peer format and applied rubrics for assessment. The course consisted of nine learning units and a final project. The results of the different units contributed to the final project, which consisted of the creation of a complete online course. This PBL methodology involves students in a project that solves a real problem; at the end of the course students

assume the role of an e-learning professional, creating their own project and evaluating their peers. Finally, students take a final exam.

Moreover, Sheridan et al. (2019) presented the use of online facilitated assessment in integrating the *work-integrated learning* (WIL) placement with the capstone theoretical content. The assessment includes (1) an essay (35% of the grade) where students apply theoretical concepts to issues posed in a newspaper article (four articles to chose form) - done as a benchmarking exercise; (2) students outline expectations before taking placements, then reflect on expectations compared with learnings and outcomes after the placement (30%); they are given resources on reflective practice and encouraged to journal through the internship; (3) final assessment (35%) designed to interrelate capstone theoretical content with WIL - apply theoretical concepts to what was experienced in the workplace - critique the internship host's activities relative to the theoretical content.

3. MAIN FINDINGS

In their study, Chanpet el al. (2020) found that learners' levels of understanding were significantly higher for the online (vs. face-to-face) section and higher in more advanced steps of PBL. Most learners perceived the online PBL and FA system as convenient. Importantly, they thought that it increased their knowledge and skills and the assessment in the system is better than traditional assessment. They felt better able to, importantly, make observations and think creatively, collect data and compile information, assess and make decisions, engage in metacognitive thinking, problem solve and complete any technical work required, create final project artefact and plan strategically. Further, the authors stressed that online technology functions in concert with the instructor's formative feedback and pedagogical scaffolds of the PBL and the learning framework; online FA relies on technological as well as social resources; the central role in FA is played by learners, as they provide evidence of their engagement.

According to Lin et al. (2021), peer-assessment can encourage responsibility, reflection and meta-cognitive perception, as well as address social loafing in PBL. Group awareness in computer-supported collaborative learning can provide each group member with a visual representation of the activity of other group members. They found that group awareness in peer-assessment (PAGA) significantly increases students' online participation, compared with traditional peer-assessment. Marks given in the PAGA group were significantly more diverse and were perceived to be more fair than those given in the peer-assessment group. It was found that PAGA could improve the quantity of member interaction but had limited effectiveness in enhancing interaction quality.

Usher and Barak (2018) examined peer feedback quality and grading accuracy in a project-based course students on-campus, online and MOOC environment. Findings indicated that the on-campus students awarded their peers with a low percentage of negative comments compared to the SPOC and the MOOC students. The MOOC participants wrote most of the negative comments; the statement comments – technical and semantic – were distributed similarly between the three groups, indicating a similar approach to what is present or missing in the assessed work according to the grading rubric, with no details or explanations. Regarding verification comments, both validated and invalidated contents were common among the on-campus students. This suggests that the on-campus assessors paid attention to the scientific and engineering

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aspects of the project. Regarding elaboration, the majority of both informative and suggestive subcategories were made by the on-campus group.

Fontanillas et al. (2016) found that students were satisfied with continuous assessment. Most students did not agree with the idea of self-assessment at first but finally understood the benefits. Similarly, most students were not comfortable with assessing their peers but they appreciated the assessment criteria. Students always valued teacher feedback during the process.

Divjak and Maretić (2017) identified four groups of advantages of peer-assessment and self-assessment: logistic (it saves teachers' time), pedagogical (students deepen their understanding), metacognitive (students are more aware of their own strengths, progress and gaps) and affective (make students more productive and cooperative). At the same time, they also recognized several groups of disadvantages: logistical (students need additional briefing), reliability risk (students are assessing their own peers), equalizing (tendency to award everybody the same mark) and metacognitive (not all students are immediately well equipped to undertake peer assessment). In order to increase the reliability of peer-assessment, they proposed an algorithm that can be incorporated in a peer-assessment online environment to detect potentially unreliable grades (Divjak & Maretić, 2016).

4. Challenges of assessment in WBL

Lin et al. (2021) explored two flows in project-based learning: social loafing (people exerting less effort to achieve a goal when working in a group than when working alone) and unfair assessment marks. Further, they claimed that the learning habits of students are difficult to change in the short term, the experience of a student during one semester may not lead to significant enhancement.

A challenge is also how to motivate students to peer-learning and specially peer-assessment. It seems that it depends on the type of learning environment. Usher and Barak's study (2018) revealed that MOOC participants provided more feedback comments (their comments were lengthier and more detailed) than on-campus or SPOC students. They also volunteered to assess more projects than their counterparts did.

Further, in several studies (e.g., Fontanillas et al., 2016) it has been found that students are reluctant to undertake self-assessment and to assess their peers. It takes time and effort for them to realize the benefit of both of them.

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5. REFERENCES

Biggs, J. (1999). What the Student Does: teaching for enhanced learning. Higher Education Research & Development, 18(1), 57–75. https://doi.org/10.1080/0729436990180105

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. Educational Psychologist, 26(3&4), 369–398.

Chang, C. C., & Tseng, K. H. (2011). Using a web-based portfolio assessment system to elevate project-based learning performances. Interactive Learning Environments, 19(3), 211–230.

Chanpet, P., Chomsuwan, K., & Murphy, E. (2020). Online Project-Based Learning and Formative Assessment. Technology, Knowledge and Learning, 25(3), 685–705. https://doi.org/10.1007/s10758-018-9363-2

Divjak, B. (2015). Assessment of complex, non-structured mathematical problems. IMA International Conference on Barriers and Enablers to Learning Maths: Enhancing Learning and Teaching for All Learners. Glasgow: Institute of Mathematics and its Applications, 1-8.

Divjak, B., & Maretić, M. (2016). Geometry for Learning Analytics. Scientific and Professional Information Journal of Croatian Society for Constructive Geometry and Computer Graphics (KoG), 48-56.

Divjak, B., & Maretić, M. (2017). Learning Analytics for Peer-assessment: (Dis)advantages, Reliability and Implementation. Journal of Information and Organizational Sciences, 41(1), 21–34. https://doi.org/10.31341/jios.41.1.2

Lin, J.-W., Tsai, C.-W., Hsu, C.-C., & Chang, L.-C. (2021). Peer assessment with group awareness tools and effects on project-based learning. Interactive Learning Environments, 29(4), 583–599. https://doi.org/10.1080/10494820.2019.1593198

Martín Núñez, J. L., Tovar Caro, E. and Hilera González, J. R. (2017). From Higher Education to Open Education: Challenges in the Transformation of an Online Traditional Course. IEEE Transactions on Education, 60 (2), 134-142. doi: 10.1109/TE.2016.2607693

Pažur Aničić, K., Divjak, B. (2021). Work-based learning in higher education – student, teacher and employer motivation and expectations. International Journal of Work-Integrated Learning, to be published

Romeu Fontanillas, T., Romero Carbonell, M., & Guitert Catasús, M. (2016). E-assessment process: Giving a voice to online learners. International Journal of Educational Technology in Higher Education, 13(1), 20. https://doi.org/10.1186/s41239-016-0019-9

Sheridan, L., Gibbons, B., & Price, O. (2019). Achieving WIL placement and theoretical learning concurrently: An online strategy for Higher Education Institutions. Journal of University Teaching & Learning Practice, 16(3). https://doi.org/10.14453/jutlp.v16i3.8

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Usher, M., Barak, M. (2018). Peer assessment in a project-based engineering course: comparing between on-campus and online learning environments. Assessment & Evaluation in Higher Education, 43:5, 745-759. DOI: 10.1080/02602938.2017.1405238

Wood, Y. I., Zegwaard, K. E., & Fox-Turnbull, W. (2020). Conventional, remote, virtual and simulated work-integrated learning: A meta-analysis of existing practice. International Journal of Work-Integrated Learning, 21(4), 331–354.

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