Optimizing the Online Learning Experience:
The Intersection of Pedagogy and Technology

Pedagogiskt docenturarbete

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Introduction

In 2020 due to Covid-19 restrictions, our university was forced to make a rushed transition to online learning. The digital transformation that had been slowly unfolding was suddenly urgent, and we found ourselves needing to become experts in new technologies and residents of the digital space. Teachers had to become aware of digital literacies that were previously not required, and courses were moved online in a panic to address the emergent situation.

For some disciplines including laboratory or clinical practices, the on-campus hands-on experience was not replicable online. However, in some cases it has improved the student experience as assignments and content delivery has been scaffolded in a more structured way.

This reflection centers on the relationship between technology and pedagogy, specifically with regards to creating an optimal learning experience for our students. When teaching online, do we limit ourselves to simply try to replicate the on-campus experience, or do we strive for an experience with added value?
Since 1999 I have been actively involved in PBL (Problem-Based Learning) pedagogy. I came across the method as a Ph.D. and soon realized that PBL mocked the frustration and learning process of my own reality. Since then, I have been teaching, organizing research, and basically operating within academy with PBL in mind. Therefore I have decided to incorporate the PBL philosophy into this reflection. This approach is deeply linked to my identity as a researcher, teacher, pedagogical developer, and instructional designer. Previous studies and my own experience have shown that incorporating PBL pedagogy in online course design can result in social learning of realistic problems. That fosters student motivation.

Here, I will analyze how the merge between PBL and technology applied to different teaching situations can be an asset rather than a hindrance in three contexts related to my academic practice:

1. Facilitating online PBL
2. One-to-one tutoring
3. Research collaboration

Specifically, I will discuss how technology can be used to create a sense of community that encourages scientific collaboration, enable student learning during online PBL sessions, and motivate students to participate in scientific co-creation.

Technology and education technology

According to UNESCO reports, educational technology is defined as "employing a combination of human and technical resources to bring about more effective instruction.". Meanwhile, educational technologists aim to analyze, design, develop, implement, and evaluate processes and tools to enhance learning (Seels et al., 1994).

These definitions suggest that educational technology is aimed to enhance the learning process, rather than create confusion for novice users.

PBL and COI model

Problem-Based Learning (PBL) is a pedagogical method embraced by Linköping University since the 1980s (PBL guide). PBL introduces "ill-structured" problems that allow for multiple
solutions or paths to solutions. PBL considers learning an active process that becomes meaningful when students can relate to real-world experiences and their own lives. In these settings, students and teachers share ownership of the learning experience, and students take responsibility for their own learning. The teacher’s role is to facilitate the learning process. In PBL, core learning occurs during meetings in small tutorial groups, and reflection and meta-reflection are considered vital for learning. Finally, student assessment should support learning and not merely validate knowledge (Barrows & Tamblyn, 1980 and Bligh, J., 1995).

PBL teachers not only facilitate knowledge construction but also scaffold successful teamwork (Savin-Baden, M., 2014). The small tutorial groups have become teams where knowledge is constructed in a community, and the student’s learning experience may depend on interconnected presences provided by other group members (social), the instructor’s directions (teaching), as well as student’s interaction with the course content (cognitive), as illustrated in the Community of Inquiry (COI) framework (Garrison, D. R., 1999).

**Figure 1.** The community of inquiry (COI) framework with the three interconnected presences that influence the learning experience.

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As we stand at the threshold of rapid changes that have been accelerated by the pandemic, there is a pressing need to prepare our students in different ways. New technologies, social media presence, networking needs, and Massive Open Online Courses (MOOCs), present a new set of challenges. Thus if online learning is carefully designed with a thorough pedagogical plan and a smart choice of technology, it can be just as welcoming as learning in a traditional classroom setting.
The use of digital tools and technologies has also impacted PBL, which can now be supported at all stages of the process, allowing for new forms of social interactions, and becoming a topic of discussion (Figure 2).

Figure 2. Some digital tools that can be used to support each step of the PBL process in relation to Bloom's taxonomy Bloom’s Digital Taxonomy

Online problem-based learning (PBL) has been in use for some time now as a means of meeting the needs of a new generation of connected, mobile, diverse, and international students. It is not a passing trend but a response to the changing educational landscape, which has been accelerated by the pandemic.

As in face-to-face PBL, students engage in verbal exchanges using communication platforms like Zoom, Teams, Adobe Connect or Blackboard, and use chat, whiteboard, presentation, or document-sharing features. The key is to ensure that the tools used are accessible, easy to use and facilitate both synchronous and asynchronous collaborative work. However, it is important
to balance the use of technology with sound pedagogical practices and engagement in collaborative online work (Savin-Baden, M., & Wilkie, K., 2006)

Technology and pedagogy must work hand in hand (Coldwell, J., 2003), and general components such as learning objectives, assessment types, and suitable teaching and learning activities should be considered when designing any learning experience, whether online or on campus. Teaching and learning activities are designed to develop skills such as fact retrieval, communication, collaboration, reflection, critical thinking, and creation. The difference when designing an online experience is that appropriate digital tools must be chosen based on the type of activity planned, and the virtual environment must be suitable for socializing, meeting the teacher and interacting with the content. Other aspects to consider include the group size, technological access, available time, synchronicity (synchronous vs. asynchronous meetings), and teacher presence (teacher-led or not).

Poor technological decisions can lead to dehumanization, frustration, and ineffectiveness, which is why student characteristics, needs, and contexts must be considered. As Diana Laurillard (Laurillard, D., 2009) said, “technologies are seldom designed with teaching and learning in mind.” It is only when the needs of teachers and learners are represented that technology and pedagogy can truly meet.

The relationship between pedagogy and technology is entangled (Fawns, T. 2022). New technologies can inspire innovative approaches to teaching and learning and can be utilized to enhance the learning experience. For instance, by participating in the ONL course, I discovered that the same tools I used for personal communication, like WhatsApp, Facebook, Instagram, and Twitter, could also be employed for professional purposes to facilitate collaborative online learning. Since my students were already familiar with these platforms, it became an advantageous resource for learning in a collaborative way rather than an obstacle to overcome.

1. Facilitating online PBL

I have adapted a PBL course to suit the online environment by combining various elements such as lectures, webinars, group meetings, role-play, and reflections, all facilitated by digital
tools (Figure 3). The teaching presence is maintained through continuous communication between course participants and teachers, using various digital resources such as Lisam, Forms, presentations and zoom. The cognitive presence is achieved through interactions between learners and research articles, pre-recorded lectures, and online tutorials, which help enrich digital skills and the course curriculum. Peer-observations, feedback, and self-created role-plays based on tutoring dilemmas keep learners active and engaged. The social presence is incorporated through interactive activities, collaborative presentations, and respectful group discussions supported by a collaborative group contract.

A new form of examination was incorporated where participants need to write a blog post encouraging individual reflections and competence development when shared with other teachers at LiU. The course evaluations have been positive and comparable to the campus versions of the course.

Figure 3. Online PBL course design. The learning outcomes were evaluated orally and with a written blogpost (yellow boxes). Several digital tools were used (pink boxes) to support learning through webinars (green box), lectures (purple box), tutorial groups and role plays (orange boxes). Instructions are provided in grey boxes and blue boxes represent activities effectuated prior to the course.
2. One-to-one tutoring

The Open Networked Learning (ONL) course is an interdisciplinary international course that emphasizes collaboration and reflection through online Problem-Based Learning (PBL) tutorial groups. Participants in this course use digital tools to present their findings and shift from information consumers to content creators. The Community of Inquiry (COI) method supports the course design, as demonstrated in studies such as Garrison, et al., 1999 and Hrastinski., 2021).

The ONL course has helped me change my tutoring approach to one that prioritizes online supervision and has allowed me to take advantage of various digital tools such as Zoom, Teams, Aperio ImageScope, OneDrive, and Dropbox. Along with content knowledge, students also acquire digital and other necessary skills that can be used in their professional lives, as shown in studies by Kek & Huijser., 2015, Carvalho., 2016, and Chi et al., 2001).

Following the PBL principles, the students owns their scientific questions and can become scientific co-creators by co-authoring publications.

As a supervisor, I prioritize creating a safe and inclusive environment that encourages open dialogue with the students and try to make them feel freedom to ask questions, recognize possible mistakes, and identify knowledge gaps without fear, in line with the study by Zhang et al., 2010).

To scaffold students' learning process, I focus on understanding their needs and ideas, asking open-ended questions, using incorrect answers as opportunities for reflection and deeper understanding, challenging learners to interpret results from different angles, and allowing the students to develop their own questions. To increase students' awareness of their learning process, I could use a taxonomy of reflection.

Based on this taxonomy these are some examples of questions that I could ask to my students:
• How would you continue this project? (creating)
• What are the strengths and limitations of the project? (evaluating)
• Do you see any patterns in what you did? (analyzing)
• How can you use what you learn applied to another scientific question? (applying)
• What was important about it? What (clinical) relevance do you see (understanding)
• Could you recall what you did during the project? (remembering)
• Write an abstract, co-author one article (creating)

3. Research collaboration

Since 2019, I have been engaged in online collaborative work with a multidisciplinary research group from Stockholm. What initially began as a non-voluntary act due to COVID-19 restrictions, has since become a welcomed long-term solution that allows for flexible meetings without the need for travel between different cities.

Thanks to technological solutions such as Zoom, we can meet remotely to present research results, discuss, edit articles, exchange ideas, and create new projects together. The group has a tacit agreement in which members acknowledge each other's contributions and are generous and open in the exchange of scientific resources and information. This welcoming atmosphere is important for the professional formation of the PhD students present.

During peer discussions, we present and validate results, co-analyze data, receive, and give feedback, and find inspiration from each other's ideas. In addition to scientific content, students also develop generic competencies such as leadership, communication, critical thinking, and other transferable skills that will be useful beyond academia (Gravett, E. O., 2017)

Research has shown that collaborative teamwork, such as what we are engaged in, increases motivation (Chickering & Ehrmann, 1996). Students feel supported by the team and receive advice from their more experienced peers, akin to group supervision.

According to Sherryl Johnson et al., 2014, good learning is collaborative and social, not competitive. Research supervision has become more participatory, with research students
collaborating with their supervisor in research projects (Fenge, 2012). This style of supervision is beginning to incorporate more elements of information and communication technology (ICTs) (Le, 2012).

Moreover, it involves the student and supervisor working together to achieve common goals, often within a community of researchers (Parker, 2009). The use of technology in postgraduate supervision pedagogy is becoming increasingly prevalent (Maor & Currie, 2017).

As stated by Chickering and Gamson, 1987, technology can enhance interactions between teachers and students and shorten the traditional delay in communication between remote students and teachers when it comes to giving timely feedback after the revision of written reports/thesis. The same authors also demonstrate that learning is enhanced when students work in a team with their supervisor, rather than working independently.

According to Wenger, 2000, learning is a social process where we learn in communities that provide a meaningful experience and change our sense of belonging and identity. The role of a teacher changes from controller to facilitator. The students also adopt various roles in the group but mainly are the leaders of their own active learning. During this process, students think, talk, reflect, relate the newly acquired knowledge to past experiences and apply it to their daily life.

Summary

- To cope with the accelerated changes at the university, teachers need to familiarize with new technologies and become residents of the digital space.
- Teachers should consider which steps are needed to add value for students when teaching online.
- The use of digital tools and technologies have also impacted PBL, which can now be supported at all stages of the process.
- PBL teachers facilitate knowledge construction and scaffold successful teamwork online that increase student motivation.
- When designing any learning experience, whether online or on-campus, technology and pedagogy must work hand in hand, and general components such as learning objectives, assessment types, and suitable teaching and learning activities should be aligned.
- Appropriate digital tools must be chosen based on the type of activity planned and the virtual environment must be suitable for socializing, meeting the teacher and interacting with the content as in COI model.
References


