

eHealth4all@EU

Interprofessional European eHealth Programme in Higher Education

IO2: eHealth Education: Pedagogical Methods Compilation

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Abstract

Problem-based learning (PBL) has become established as a successful didactic approach far beyond the field of medicine. Although there is no single concept of PBL, there is agreement on its objectives and implementation. Of central importance is the case that supports autonomous and reflective learning.

Even before COVID-19, digital methods were used in traditional PBL. These served to support, for example, the provision of learning materials. As a result of university closures during the COVID-19 pandemic, technical solutions were made available at an unprecedented speed, which made it possible to implement the different requirements of traditional PBL in a digital PBL (DPBL).

The present study results based on two scoping reviews demonstrated that PBL can be implemented digitally and that different digital methods, both asynchronous and synchronous, are available for the different steps. They show that DPBL not only leads to comparable student performance, but can also develop further competences, e.g. digital communication. With the findings, a concept for the implementation of DPBL as well as recommendations for the further development of DPBL are available.

1 Introduction

Problem-based learning (PBL) has become established as a successful didactic approach far beyond medicine. PBL is also used outside of study programs, for example in advanced training. Although there is not a single concept of PBL, similarities can be identified for the majority of approaches: such as a high level of structuring with usually three phases, the use of cases and the alternation between group and self-study phases. There is also broad agreement with regard to the goal, in that students reflect on and purposefully expand existing knowledge through autonomous learning - with the formulation of their own learning goals. In this way, students are well prepared for the challenges of the 21st century.

Digital methods were already used in traditional PBL before COVID-19. These served to support, for example, the provision of learning materials. A significant innovation of this time was the implementation of key elements of traditional PBL in a digital teach-

ing/learning format. This took place in a blended or fully online format with asynchronous and synchronous phases. Here, too, the focus is on the case that provides the impetus for dealing with the respective subject area. As a result of the closures of the universities, technical solutions were made available at a speed that had not been available before, which made it possible to transform the different requirements of traditional PBL into digital PBL (DPBL).

The results of the scoping reviews showed that DPBL can be implemented in a similar way as traditional PBL and leads to similar results. In addition, DPBL contributes to the development of further competencies that make students well equipped for the digital transformation in society and healthcare.

2 Methods

IO2 included the following work packages:

WP01: Create IO framework draft, work plan and briefing material

WP02: Compile problem-based Learning overview and implications for the project

WP03: Compile overview of technologies supporting PBL and consensus on their use

WP04: Develop a concept of PBL for topics relevant for this program

WP05: Consolidate activities and conclusions in report of O2

Within the first work package, the work plan was discussed and refined in relation to the intended project goals. This included the concept specification of problem-based learning in the context of higher education.

Based on the scoping review approach, the methodological approach was specified for the second and third work package. This includes the development of a search string, with the definition of search terms, the specification of databases and the inclusion and exclusion criteria. The search had to be refined and conducted several times due to the heterogeneity of the findings.

In order to assess the current state of development, a systematic literature search was conducted for the period from 2010 to 2020 with the aim of identifying how DPBL is implemented in medicine/public health. The search was conducted in PubMed and CINAHL. The search yielded 436 hits, of which 24 publications were included.

As a result of the digitization push in teaching at universities due to the COVID-19 pandemic, a further systematic literature search was carried out with the aim of identifying study programs in which DPBL was offered as a blended or fully online format. For this purpose, another systematic search was conducted for the period from 2017 to 2022 (March) in the following databases: Web of Science Core Collection, PubMed, CINAHL, Cochrane Library, and Scopus. A total of 1007 hits were obtained, of which 7 studies were selected.

Based on these search results, specific recommendations were derived regarding the use of digital tools in the implementation of DPBL.

3 Results

Both systematic searches were able to show that the goals of traditional PBL can be achieved with digital forms of instruction. For the individual phases, lecturers have a variety of tools at their disposal to support the learning process.

The results of the initial scoping review confirmed that there is no single definition of traditional PBL and different modes of implementation. An analysis of the included publications (N=24) showed that digital tools were widely used to support PBL. Frequently used were chatrooms, web forums or online discussion boards specially to brainstorm or formulate learning goals for PBL. Videos, YouTube or recoded lectures were also applied. More rarely quizzes (N=5), virtual reality like virtual patients (N=3) or video conferences (N=3) were used. With regard to learning outcomes, the majority of studies showed that digital tools can achieve better or comparable results.

The second scoping review showed that the different steps of traditional PBL can be implemented well in a blended or fully online format. The authors used different digital tools for asynchronous and synchronous exchange to realize the different PBL steps. What stands out is that the majority of the studies (N=7) use web conferencing systems for simultaneous exchange between students. The studies also show that the implementation of the different steps largely corresponds to traditional PBL, but that there are nevertheless special features in digital teaching. This concerns the tasks of the tutors, who are additionally not only entrusted with the technical processing, but also have to cope with other forms of social interaction. The latter in particular poses a challenge to the goals of PBL. It also became clear that DPBL requires an effective

technical infrastructure and knowledge of how to use it. A comparable student performance can be achieved with DPBL.

A concept as well as specific recommendations for the implementation of DPBL could be derived and brought into the development of the project's modules.

4 Conclusion

Both PBL and DPBL are useful teaching/learning methods to promote students' competence development beyond a narrow subject-specific qualification. The study results show that DPBL can be implemented in a comparable way to traditional PBL and that similar student performance can be achieved.

The clear structure of traditional PBL makes it easy to transfer to digital teaching; it also offers a good opportunity to be applied to other teaching formats, such as summer schools and advanced training. The wide range of digital possibilities makes it possible to find optimal solutions for the asynchronous and synchronous parts of DPBL. Furthermore, students are additionally strengthened in their digital competences.

The case is at the center of PBL/DPBL. Accordingly, the quality of the case makes a decisive contribution to shaping the learning process in terms of the intended learning goals. The case can be designed independently, i.e. for the content of a course, or comprehensively, as a bridge between different course contents. Accordingly, case development should be done in a structured way and reviewed through peer evaluation. Optimally, students should be accompanied by supporting materials when working on the case. This is all the more important if there is little time available for conducting research, e.g. in the context of a summer school.

Beyond the specific recommendations for the design of DPBL courses, further needs could be identified on the basis of the scoping reviews. A major challenge is the separate enhancement of DPBL, since, as the results have shown, there is greater potential in this teaching format, which is expressed, among other things, in the empowerment of digital communication. To this end, it is necessary to further analyze the implementation of DPBL in order to better understand how, for example, collaboration processes can be supported or individual student qualifications can be taken into account.

References

Babitsch B, Pöche-Guckelberger I, Maske D, Egbert N, Hübner U. Concepts and Implementation of Digital Problem-Based Learning (DPBL) in health-related Study Programmes - a Scoping Review. *Innovations in Education and Teaching International*. (2022, submitted)

Hübner U, Thye J, Shaw T, Elias B, Egbert N, Saranto K, Babitsch B, Procter P, Ball MJ. Towards the TIGER International Framework for Recommendations of Core Competencies in Health Informatics 2.0: Extending the Scope and the Roles. *Stud Health Technol Inform*. 2019;264:1218-1222. doi: 10.3233/SHTI190420.

Appendix

Presentation:

Babitsch B, Pöche-Guckelberger I, Maske D, Egbert N, Hübner U: Concepts and Implementation of Digital Problem-Based Learning (DPBL) in health-related Study Programmes – a Scoping Review.



Concepts and Implementation of Digital Problem-Based Learning (DPBL) in health-related Study Programmes - a Scoping Review

Babitsch B, Pöche-Guckelberger I, Maske D, Egbert N, Hübner U

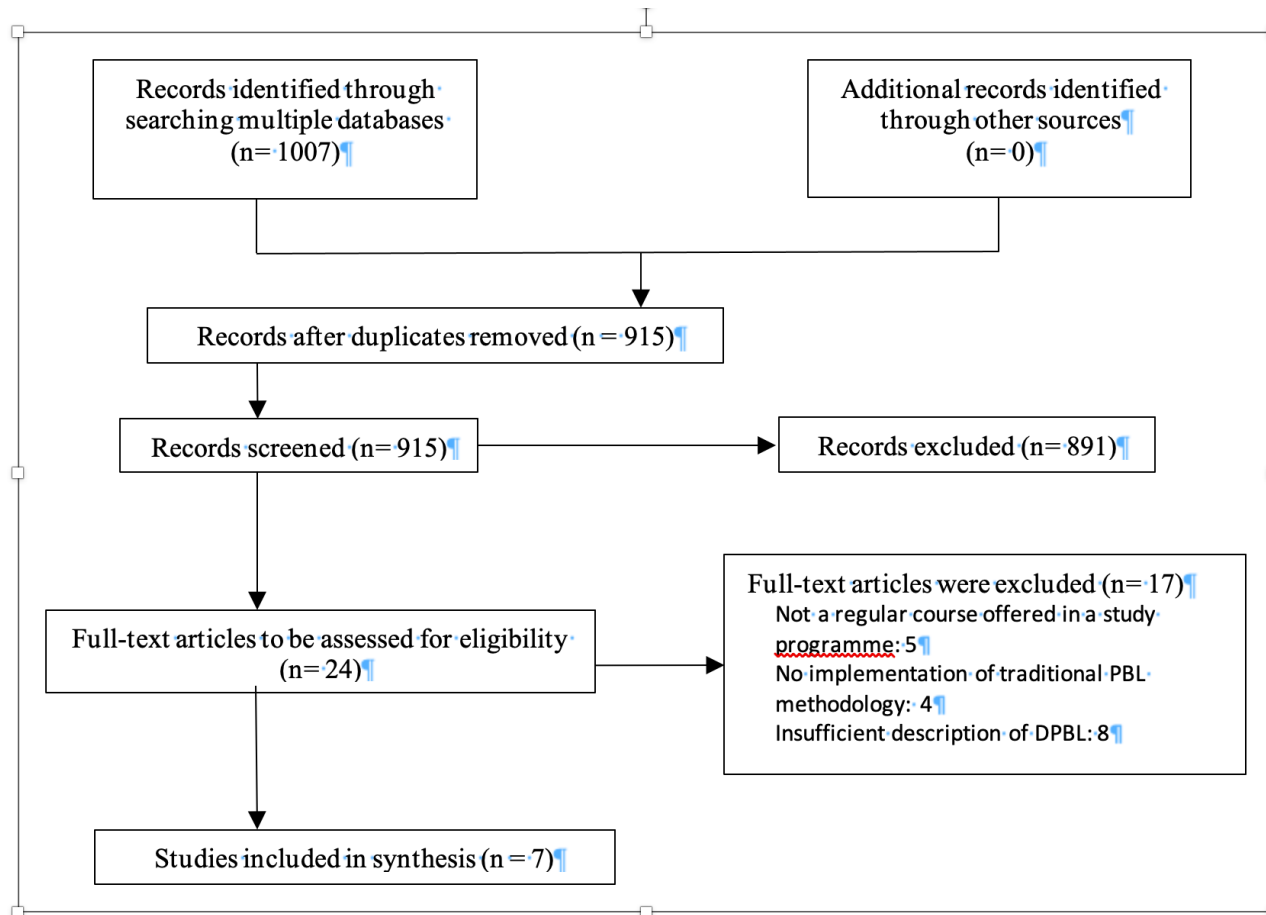
Aim

- to investigate whether the principles of PBL can be implemented in a digital format and whether comparable results can be achieved in students' competence development.
- to derive specific recommendations for the provision of DBPL

Methods

- Systematic literature search for the period from January 2017 to March 2022
- Databases used: Web of Science Core Collection, PubMed, CINAHL, Cochrane Library and Scopus.

Methods



Results | Study characteristics

First Author	Publication year	Country	Study programme	Duration DPBL course	DPBL format
de Jong et al.	2017	The Netherlands	Health Services Innovation, Global Health, Health Professions	Module, 8 weeks	Blended-Learning
de Jong et al.	2018	The Netherlands	Public Health	Module, 8 weeks	Blended-Learning
Saqr et al.	2018	Kingdom of Saudi-Arabia	Dental Medicine	5 days	Blended-Learning
Jaiprakash et al.	2019	Malaysia	Medicine	8 days	Online
Erickson et al.	2021	Australia	Speech pathology, Occupational therapy	5 days, plus icebreaker session	Online
Murata et al.	2021	United States of America	Dental medicine	3 weeks	Online
Foong et al.	2022	Malaysia	Medicine	n/s	Online

n/s = not specified

Results | DPBL

- Seven-step approach is often used
 - Case and group work as essential elements
- Different digital tools were used
- Almost all programmes employed tutors who were responsible for the group sessions

Results | Study results

- Student Roles
- Tutor Roles and Responsibilities
- Social Interaction
- Satisfaction with Blended DPBL/DPBL
- Learning Outcomes and/or Skill Development
- DPBL Potential

Discussion/Conclusion

- PBL can be provided digitally, either in a blended or fully digital format
- DPBL cannot be seen as a simple digital transformation of PBL
- DPBL offers additional opportunities for competence development

Recommendation | Execution of DPBL

- (a) Providing an introduction to PBL/DPBL if students have no experience with the teaching/learning methods
- (b) Provision of an introductory session at the beginning of the module or seminar to introduce the digital technologies, discuss the roles of students and tutors as well as establish a common netiquette
- (c) Setting up a clear structure based on the three phases of traditional PBL, to which the asynchronous and synchronous units as well as the accompanying material are clearly assigned

Recommendation | Execution of DPBL

(d) Creation of ideal conditions for digital teaching, which, in addition to the provision of the technical infrastructure, may also mean additional personnel resources (e.g. in the creation of DPBL or in the supervision of group sessions)

(e) Use of different digital technologies in order to support the learning process of the students in the best possible way; if necessary, new methods could be introduced via small tutorials

Recommendation | Evidence base for DPBL

- (a) Sharpening the terminology of DPBL through differentiation according to the use of digital tools for PBL implementation (goal: clear terminology and sharpening of existing approaches)
- (b) Documentation of DPBL courses in terms of their didactic implementation to make the range of approaches and their implementability visible and available (goal: reduction of the “black box”)
- (c) Conducting further studies to work out the specifics of DPBL in comparison to PBL, e.g. identifying new competencies among students and tutors (e.g. digital competencies in the area of communication and technology) and to achieve the further development of DPBL on this basis (goal: further methodological/conceptual development).

Questions?

