

Research Article

Benefits and Outcomes of Student-Centred Learning Strategies in a Healthcare Higher Education Institution Setting - A Scoping Review

Eija Metsälä* and Sanna Törnroos

Faculty of Health Care Diagnostics and Service Management, Metropolia University of Applied Sciences, Finland

Abstract

Objectives: The aim of this scoping review was to examine the evidence demonstrating the outcomes and benefits of student-centred learning strategies used in health care higher education institution settings.

Review method: PubMed, Science Direct, CINAHL via EBSCO Host and OATD dissertation databases were used in the search. The keywords used were co-creative learning, students as partners, collaborative learning, inquiry-based learning, cooperative inquiry and co-construction of knowledge. The modified version of the STROBE v4 checklist for cohort, case control and cross-sectional studies was used for quality assessment.

Results: Eleven full text articles using collaborative (n=9) and inquiry-based learning strategies (n=2) were selected for review. The results regarding measurable learning outcomes such as scores or proportion of students successfully completing the learning unit were inconclusive. However, with regard to qualitative studies, improvements in many kinds of generic and health care-specific skills and competencies were reported. Students were also satisfied with the use of student-centred methods, which was reflected in their reported motivation.

Conclusion: More high-quality research into the measurable outcomes of student-centred learning strategies is needed. However, these learning strategies seem to be useful in developing many of the skills and competencies needed for health care professions.

Keywords: Student-centred learning; Educational institution context; Health care students; Higher education institution

Introduction

Health care staff education in different fields has many common features that stem from the nature of these professions. Health professions aim to prevent, diagnose and treat illnesses as well as care for patients and their next of kin in a holistic way using the latest available knowledge in the patient's best interests. Health care staff must learn various types of theoretical, practical and psycho-social knowledge, skills and competences. According to the WHO [1] the main objectives of all health care staff pre-service education is to build knowledge in and appropriate attitudes toward relevant public health programs and strategies; improve practical skills, particularly the application of evidence-based clinical guidelines; prepare students to support and follow local guidelines and policies and to work within a national health system. The complexity of health care environments and interprofessional work requires health professional graduates to have higher thinking skills [2]. Different types of pedagogical methods are essential for learning different types of theoretical, practical or psycho-social knowledge, skills and

competences. Health care pedagogy is nowadays based on student-centred learning methods. One reason is that these methods seem to support the integration of theoretical knowledge and practical skills and help students to develop into proactive learners. They also seem to produce better-motivated students and improve satisfaction [3], student engagement, empowerment and responsibility [4], produce deeper learning [5] and better clinical reasoning skills [6]. Typical learning strategies used in health professionals' education include but are not limited to, problem-based learning [7,8], various forms of e-learning and blended learning [9,10], simulation [11,12], evidence-based learning [13], case-based learning [14], game-based learning including educational games [15,16] and role play [17]. In addition to the previously-mentioned learning methods, other student-centred learning strategies emphasise empowerment, dialogue, collaboration and equity between learners and teachers, as well as interprofessionalism and collaborative research [18,19]. Students with different performance levels work toward a common goal. They are positively interdependent, rely on each other while retaining individual accountability, interact socially and perform peer evaluations [20]. Students also take responsibility for their own and fellow students' learning experience. A co-creative learning strategy combines students' and teachers' areas of expertise to create the best learning environment for the student [21]. One of the key features of this pedagogic approach is the relationship between student self-direction and learning ownership. The more self-directing students becomes, the more they govern their own learning. The teachers' role is transformed from that of guide to facilitator, and finally to information broker. Several terms with slightly different emphases are used to describe these student-centred learning strategies: collaborative learning [20], students as partners [22], inquiry-based learning [23], cooperative inquiry [24], co-construction of knowledge

Citation: Metsälä E, Törnroos S. Benefits and Outcomes of Student-Centred Learning Strategies in a Healthcare Higher Education Institution Setting - A Scoping Review. *Am J Nurs Stud.* 2021;2(1):1008.

Copyright: © 2021 Eija Metsälä

Publisher Name: Medtext Publications LLC

Manuscript compiled: Jan 27th, 2020

***Corresponding author:** Eija Metsälä, Faculty of Health Care Diagnostics and Service Management, Metropolia University of Applied Sciences, Myllypurontie 1, PO BOX 4000, 00920 Helsinki 00079 Metropolia, Finland, Tel: +358 50 347 8177; E-mail: Eija.Metsala@metropolia.fi

[25] and co-creative learning [18]. These frameworks have all been used to describe partnership and co-creation roles in educational and research activities [18]. Student-centred learning strategies have been used in health care education both in clinical settings and a higher education context. This scoping review seeks to examine the evidence that describes the outcomes and benefits of student-centred learning strategies, particularly when used in healthcare higher education institution settings.

Materials and Methods

Search strategy

The electronic databases were used: PubMed, Science Direct, CINAHL via EBSCO Host and OATD, a database of academic dissertations. The keywords used were co-creative learning, students as partners, collaborative learning, inquiry-based learning, cooperative inquiry and co-construction of knowledge. A title level search was performed on the databases between 15 May 2020 and 15 June 2020. A selection process was then performed based on inclusion and exclusion criteria. The selection was first made at the title level, then at the abstract level and finally at the full text level from June - August 2020. All stages of the process were conducted independently by two reviewers. In the event of disagreement, the reviewers debated their viewpoints and reached consensus via negotiation.

The inclusion criteria of the studies were that they were written in the English language. We included qualitative and quantitative studies with different approaches and designs, including systematic, integrative and scoping reviews as well as licentiate and PhD dissertations. We included only studies pertaining to the education of health care students, learning in educational institution settings and studies where a student-centred approach was evident. The timeframe of the studies selected for review was ten years starting from May 2010.

Exclusion criteria: We excluded books, Master- and Bachelor-level theses, narrative and lower-level reviews as well as editorials. We also excluded articles describing implementation of learning strategies without clear research focused on the benefits and outcomes of learning, and studies focusing on testing the effect of technological tools when outcomes of learning strategy could not be separated from the outcomes of using the tool. Studies were also excluded where learners were not healthcare students as well as studies where learning did not take place in higher education institutions e.g. in health care institutions or clinical placements. We also excluded studies using co-operative inquiry as a research method and not as a learning strategy. In formulating a scoping review question, the PICO model is often used for quantitative studies while the PICO model is applied to qualitative descriptive studies [26]. This review used a combination of PICO and PICo. P indicates population, I intervention, Co context and O outcome.

The review question was: What kind of learning outcomes (O) or benefits (O) did student-centred learning strategies (I) produce for participants (P) in health care education at higher education institution settings (Co)?

Quality appraisal and assessment of bias

The reviewers independently evaluated the quality of the reporting in the studies according to a modified version of the STROBE v4 checklist for cohort, case control and cross-sectional studies (combined) [27]. This checklist was chosen over other available options because the authors wanted to include studies with several

types of methodological approaches and designs, including previously published systematic, integrative and scoping reviews about the topic, since it was anticipated that few high-level publications would satisfy the selection criteria. A quality evaluation of each study methodology and design based on different checklists was not conducted. Rather, the focus of the review was to develop a broad understanding of the kinds of benefits and outcomes reported in student-centred learning strategies in a health care education context and not to rigorously demonstrate the effectiveness of the learning strategy. The use of a modified version of the STROBE v4 checklist for cohort, case control and cross-sectional studies allows for a commensurable evaluation of all the studies and displays the evaluation results in a table format. This type of evaluation criterion has previously been used in several published integrative reviews [28-30]. Articles accepted for full text level inspection that did not at least partly satisfy more than two of the ten checklist assessment criteria were excluded. Both authors first assessed the full text papers individually, and then compared (1.9.2020) their individual assessments. There were some deviations in 9/110 assessment points (10 criteria * 11 articles). Articles for which assessments diverged were inspected once more and consensus negotiated. According to the authors' assessment, only one study fully satisfied all ten criteria [31] while another met all but one out of ten quality criteria [32]. Most deficiencies were found to lie in failing to clearly describe study purpose, aims and research questions and in addressing potential sources of bias (Table 1).

Search outcomes

With the selected keywords and their combinations, a total of 1,186 results were obtained using the following databases and search engines: PubMed (n=165), Science Direct (n=633), CINAHL via EBSCO Host search engine (n=300) and the OATD database of academic dissertations (n=89). One article was found by the first author in Google Scholar as a random result while checking the title of a different article suggested in search findings. All of the titles were read and compared by both authors based on the review's inclusion and exclusion criteria, resulting in the exclusion of most of the titles (n=1,130). The PubMed database was first inspected, and if the title included in PubMed came up in other databases, the duplicate was removed at this stage. This exclusion process yielded 56 titles to be read at the abstract level. These abstracts were carefully inspected by both authors, resulting in 24 papers selected for a full text review. The papers were once more compared based on inclusion and exclusion criteria and also assessed for quality by both authors, producing 11 articles to be included in the scoping review. The main reason (n=6) some papers were excluded at the final stage of the assessment was a lack of learning outcome evaluations. Two papers presented an evaluation of outcomes, but the focus was not on learning e.g. web-based software or a product associated with learning. Four papers did not contain proper research into learning outcomes or the benefits of learning methods, but merely offered a description of the learning strategy's implementation process. A review of the full text of three papers revealed that the context of learning was not an educational institution but a clinical environment. One paper was excluded because of poor scientific quality as well as improper focus (Figure 1).

Data analysis

The results of the selected studies were first tabulated (Table 2), following which the main results were organised in a table according to the learning outcomes and benefits of student-centred learning strategies (Table 3).

Results

Description of selected studies

The selected studies were published between 2011 and 2020. Three of them were published in the United States [33-35], three in Scandinavia [31,36,37] and one each in the United Kingdom [38], Spain [39], China [40], and Singapore [41]. Four were retrospective interventional studies [35,37,38,41], three represented different types of quasi-experimental studies [31-33], two were systematic reviews [36,40] and one was a descriptive evaluative study [39]. Nine studies dealt with collaborative learning [31-37,40,41] and two studies focused on inquiry-based learning [38,39].

Learning outcomes

According to the selected studies [35,37,39] the use of collaborative or inquiry-based learning strategies resulted in higher scores or otherwise improved performance as well as effective learning [38]. However, in some studies [32,34] the use of collaborative learning during course implementation did not reflect a larger proportion of students passing the course compared to the use of traditional learning strategies. The use of collaborative learning and inquiry-based learning was found to improve several types of skills: nursing and clinical skills [33,36,40], communication and presentation skills [38,39], holistic thinking and information synthesis skills (Naylor 2011, Ignacio et Chen 2020), critical thinking skills [34,37- 39], independent learning skills [32,38,39] interpersonal and interprofessional skills, [33,39,40] as well as teamwork and collaboration skills [33,36,38]. A study by Rodriguez et al. [39] mentioned that inquiry-based learning developed creativity.

Benefits

According to the selected studies, students were highly satisfied with collaborative learning and inquiry-based learning strategies

[31,36,39] and reported positive experiences during their use [37,39,40]. However, this did not have an effect on general satisfaction with learning experiences and methods. Once collaborative learning ended, student satisfaction decreased [31]. Using collaborative learning strategies seemed to improve student motivation [31,36] and increase attendance rates [35]. Other positive aspects of collaborative learning were reported as the possibility to give immediate feedback as well students' active role during the learning and teaching process [37]. It was also reported that collaborative learning increased students' self-confidence and their understanding of other learners, disciplines and education in different fields [33].

Discussions

The scoping review yielded inconclusive findings regarding measurable student performance based on the use of student-centred learning methods. Some studies reported improved performance [35,37,39], while others did not [31,34]. This can of course be attributed to different target groups and settings as well as different outcome metrics and measurement methods, but also because of the lack of randomised intervention studies which would result in high-level evidence. According to the studies included into this scoping review, student-centred learning methods improved health care profession-specific skills such as nursing and clinical skills as well as various generic skills that are also essential also in many other professions e.g. communication and presentation skills, critical thinking skills, independent learning, holistic thinking and information synthesis skills, to mention a few (Table 3). There may be many explanations for this and one of them may be that the learning strategy encourages students to think critically, sometimes learn independently, consider the bigger picture, synthesise information from various sources and combine new information with prior knowledge [18-20]. Many of the studies reported a high level of student satisfaction [31,36,39]

Table 1: Critical assessment of the reporting of the studies.

Reference	Assessment criteria of the studies.									
	1	2	3	4	5	6	7	8	9	10
[37]	*	*	**	**	*	**	*	**	**	**
[38]	*	*	*	**	x	*	0	*	0	*
[33]	*	**	**	**	*	**	*	**	**	*
[40]	**	**	**	x	x	*	0	*	0	**
[39]	**	*	**	**	*	**	**	**	**	**
[34]	**	*	**	**	0	**	*	**	*	**
[35]	*	0	**	*	*	**	**	*	**	*
[32]	**	*	**	**	**	**	**	**	**	**
[31]	**	**	**	**	**	**	**	**	**	**
[36]	**	**	**	x	x	**	**	**	**	**
[41]	**	*	**	**	x	*	*	*	**	*

1. Study background and theoretical framework are clearly defined.
2. Purpose, aim and research questions are clearly defined.
3. The design is clearly stated.
4. The setting is clearly described.
5. Independent and dependent variables, confounders are clearly identified and consistently implemented.
6. Data sources and analysis methods are clearly described.
7. Efforts to address potential sources of bias are described.
8. Research questions are answered logically.
9. Study limitations and generalizability are discussed.
10. Relevance to the topic.

** assessment criteria are satisfied.

* assessment criteria are partly satisfied.

0 assessment criteria are hardly or not at all satisfied.

x assessment criteria do not apply.

Table 2: Description of selected studies.

Reference	Country	Aim an purpose	Design	Data and methods and target group	Learning outcomes and benefits of co-creative learning
[37]	Denmark	To study implementing the impact of implementing active collaborative learning strategy by using peer instruction (PI) in pharmacology lectures.	Retrospective interventional study.	Impact of the learning strategy was tested by online voting. Active learning strategy using peer instruction (PI) was implemented on pharmacodynamics lectures (n=689 exam submissions) and compared with conventional teacher-led implementations (n=408 exam submissions). Student's perception on the teaching strategy was evaluated in six independent classes of students across three 5 ECTS courses, by online anonymous voting and written feedback. Data-analysis methods used were ANOVA and GLM.	Learning outcomes: The number of students achieving 50% or more of the maximum points per exam was significantly increased in PI group (p=0,029, OR 1.83, CI 1.07-3.15) Activating students during lectures help them to activate their thinking skills. Benefits: Both students and teachers perceived positively the active learning strategy and the Possibility to give and receive immediate feedback of student's learning process. Using PI students learn together and teacher's role changes from the disseminator of knowledge to facilitator of learning.
[38]	UK	To implement enquiry based learning strategy in science of imaging technology course and study student experiences.	Retrospective interventional study.	Enquiry based learning sessions comprised 6 whole group sessions with 36 students, 6 seminars with 18 students and 6 practical group sessions with 9 students. Formal evaluation with the students was undertaken via a questionnaire comprising open and closed questions which provided qualitative and quantitative data. These were analysed by thematic analysis and descriptive statistics.	Learning outcomes: working with the team made learning effective (34/35 of the students), developing team working skills (32/35), helped in activating prior knowledge and synthesising with new knowledge (32/35), developing learner autonomy and transferable skills, confidence in evaluating information found (25/35) and improved presentation skills (25/35).
[33]	USA	To assess the perspectives of dental and dental hygiene students regarding collaborative learning after taking two courses together.	Repeated cross-sectional design study	The target population consisted of all first- and second-year dental hygiene students (DH1 and DH2) and all RIDE dental students (D1) participating (N=193/323) in the Introduction to Clinical Dentistry and Introductory Periodontology courses during AY 2010 through 2014. At the end of each course, all students were sent an email with an online survey link asking them to participate in a voluntary survey on shared learning.	Learning outcomes: Shared learning strategy helped students learning to solve clinical problems and contributed to students' understanding the different roles of dentists and dental hygienists. Benefits: Shared learning was beneficial to student's future practice in a dental team, had a positive impact on perceptions of the other discipline, and helped them become better team members, as well as increasing their awareness of the training and education of each group and helped them to understand course content.
[40]	China	To investigate the current state of science related to collaborative learning in higher nursing education.	Systematic review	Previous relevant literature was searched and located from three electronic databases including CINAIL, PubMed, and Google Scholar.	Learning outcomes: Collaborative learning enhanced theoretical nursing knowledge and skill performance and professional competency and interpersonal skills. Benefits: Positive learning experience.
[39]	Spain	To study if interprofessional inquiry based learning (IBL) approach can enhance the development of creativity and research skills.	Descriptive-evaluative research	529 undergraduate human biology and medical students performed the interprofessional IBL course, 198 with the creativity workshop and 331 without. Students' perceptions of learning processes and outcomes were assessed in surveys and focus groups. The final learning results from both groups of students were analyzed by the teachers of the course and the researchers.	Learning outcomes: Final grades were higher in the promotions that performed the creativity workshop than the promotions that did not. All the scientific products developed were rated high for creativity. Oral and written communication, critical information search and self-learning skills were developed. Benefits: Students considered that creativity enhancers foster the development of creativity. They rated their satisfaction and the usefulness of the course, as well as training "support", "group environment", and "class environment" highly. Students gained experience in the designing laboratory experiments, searching for protocols, planning interventions, analyzing problems, seeking solutions, and evaluating contributions. Discussing problems with peers gave students a critical view of the possibilities, limitations, and improvements of their research.
[34]	USA	To evaluate learning outcomes and student perceptions of collaborative learning in an undergraduate nursing program.	Action research	Students in the traditional (4-year; n = 193) and accelerated (12-month; n = 153) baccalaureate nursing programs at a midsized, Midwestern private college of nursing. Three phases after which data on student learning outcomes and student perceptions of collaborative learning were collected and analyzed.	Learning outcomes: The number of students who passed the unit examination was not significantly different between the 3 phases. Collaborative learning increase critical-thinking and problem solving abilities, and improve interpersonal communication skills. Benefits: Students had positive and negative perceptions about the use of collaborative learning. The collaborative classroom provides students with opportunities to master content. However, careful planning and orientation to this process are required for teaching and learning success.

[35]	USA	To study if collaborative learning improves attendance and performance at didactic activities and different educational outcomes.	Retrospective interventional study.	Division of Hematology/Oncology at the University of Arkansas for Medical Sciences fellows were assigned to one of three teams to work together to prepare the didactic sessions and to study for the in-training exam. Presentation points were based on the post-activity evaluations. Sixty educational events were included in this project. The participants evaluated the whole activity at the end of the year using a formal written evaluation and during a debriefing session at the June 2015 semi-annual fellowship retreat.	Learning outcomes: Collaboration positively impacted fellows' performance. Benefits: Attendance at the didactic lectures improved over 30% through this project. The quality of the presentations was very good overall and helped bring depth and elicit interest and participation in the didactic sessions.
[32]	USA	To evaluate the effectiveness of collaborative learning and determine the growth in intellectual development of first-year dental hygiene students.	A randomized, 2 group research design.	The control group (n=26) used traditional pre-clinical teaching and the experimental group (n=28) collaborative pedagogy for instrument introduction. All students were subjected to a post-test evaluating their ability to apply the principles of instrumentation. Intellectual development was determined using pre- and post-tests based on the Perry Scheme of Intellectual Development. Student attitudes were assessed using daily Classroom Assessment Activities and an end-of-semester departmental course evaluation.	Learning outcomes: There was no significant difference between collaborative learning and traditional learning in achieving pre-clinical competence in the ability to apply the principles of instrumentation. Nor in the advancement in intellectual development. students' perceptions and attitudes concerning pre-clinical dental hygiene education were the same for both groups. Benefits: Collaborative learning decreased student reliance on authority, increased recognition of peers as legitimate sources of learning and increased self-confidence.
[31]	Finland	To evaluate the effects of a digital educational intervention on collaborative learning in nursing education	A quasi-experimental study - pre and post test	The intervention group (n=87) studied using a collaborative digital learning environment and the control group (n=38) studied in the traditional classroom setting. The educational intervention provided by the digital learning environment was compared to traditional classroom based face-to-face teaching for the course in Health Promotion. Pre and post-test data was collected with web questionnaires fixed to the learning platform.	Learning outcomes: Intervention group scored higher in learning outcomes. Benefits: Students had higher satisfaction in the area of promoting collaborative group work. After the education intervention there were no significant differences between the intervention group (IG) and control group (CG) in terms of the student's satisfaction of studying. Intervention group student satisfaction decreased after completion the course.
[36]	Finland	To evaluate the effectiveness of educational interventions in digital collaborative learning implemented in nursing education.	A Systematic review of randomized controlled trials	CINAHL (EBSCO), ERIC, MEDLINE (Ovid) and Scopus databases were used to identify original peer-reviewed RCT studies published between 2003 and 2018.	Learning outcomes: Digital collaborative learning increased students' knowledge and nursing skills. The results show that collaborative learning in digital learning environments enhanced nursing students' interaction and collaborative skills and problem-solving skills. Benefits: Using the method increased student satisfaction and motivation for learning.
[41]	Singapore	To describe a collaborative learning workshop that was developed for first year undergraduate nursing students and to explore its effectiveness and feasibility for future use.	Retrospective interventional study.	All 125 first year nursing undergraduate nursing students in their 2nd semester of study participated in the collaborative learning workshop. Focus group discussions were conducted a week after the students' seven-week clinical posting. Thematic analysis was used to analyse the scripts.	Learning outcomes: Collaborative learning helped students to interrelate and synthesise knowledge that was presented in different modules, reinforce the understanding of already known concepts and facilitate the linking of these concepts to create new knowledge and foster students' holistic understanding.

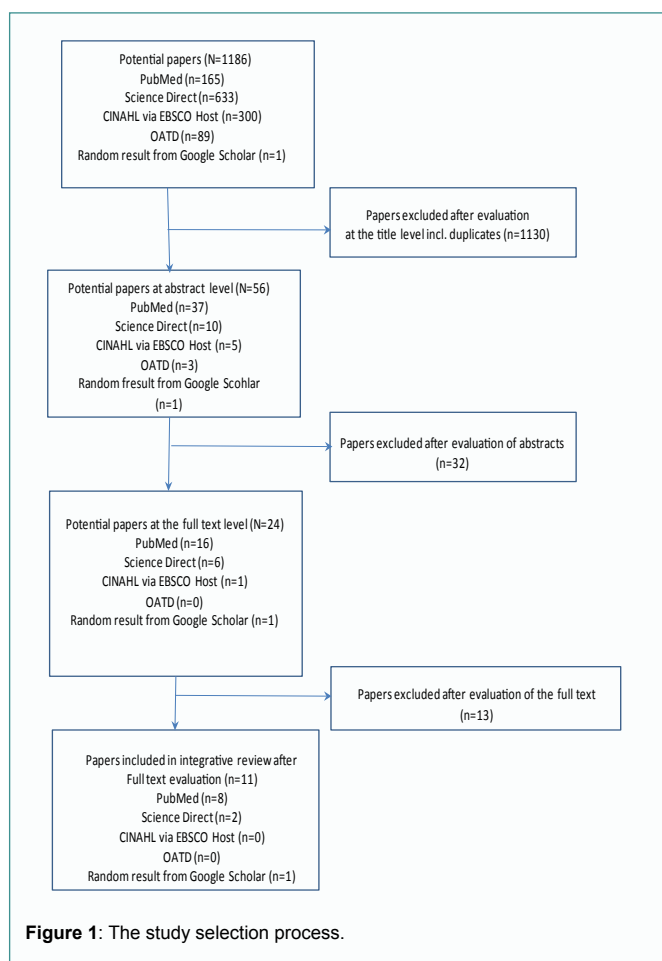
and positive experiences [37,39,40] when student-centred learning strategies were used. However, this was not reflected in general student satisfaction following the use of student-centred learning methods [31], implying that satisfaction was not due to the method itself. Interprofessional collaboration was mentioned as one benefit [33] but it seems that collaborative teams should have approximately the same level of learning, for benefits to outweigh possible disadvantages. A study by Schoening et al. [34] also described disadvantages, such as the fact that while students enjoyed independent tasks, they also felt neglected by the teacher. The review also revealed that increased study motivation [36] and attendance rates [35] were reported. Attendance requires motivation in cases where participation in learning activities is not mandatory. Since this was not reported in the study in question [35], it can be concluded that increased attendance was the result of

increased student motivation.

The above-mentioned findings should not come as a surprise. When students are placed at the very core of their own learning processes, they inevitably feel empowered and motivated. Student-centred approaches facilitate more personalised learning, allowing students to focus more on subjects they find interesting and motivating. Even if learning outcomes did not improve, increased student satisfaction is a valuable outcome. It is therefore remarkable that educators appear to have overlooked these findings, leading to the prevalence of teacher-led methods in many countries and educational institutions. In the authors' experience as professional higher education teachers in the healthcare field, teacher-led methods still have their place as they add variety to teaching methods. In addition, there are some topics for

Table 3: Learning outcomes and benefits of co-creative learning and allied learning strategies.

Learning outcomes	Benefits
<p>Better performance</p> <ul style="list-style-type: none"> higher scores or otherwise improved performance during co-creative learning implementation [35,37,39] effective learning [38] number of students passing the course or achieving competences was the same as in case of traditional implementations [32,34] Improved skills improved nursing and clinical skills [33,36,40] improved communication and presentation skills [38,39] critical thinking skills [34,37-39] independent learning skills [32,38,39] improved holistic thinking and information synthesis skills [38,41] improved interpersonal and interprofessional skills [33,39,40] developed team work and collaboration skills [33,36,38] developed creativity [39] 	<ul style="list-style-type: none"> high level of satisfaction with collaborative learning [31,36,39] students' positive experiences of the learning strategy [37,39,40] no increase in satisfaction with studying in general [31] increased student motivation [31,36] increased attendance rate [35] possibility to give immediate feedback during the process [37] students' active role [37] increased student self-confidence and understanding of other learners, disciplines and education in different fields [33]



which lecturing is an effective delivery method. However, if we want to place students at the centre of their learning experiences, student-centred methods should govern teaching in the field of health care and perhaps in many other professions. This does not diminish the role of the teacher or their pedagogic expertise. On the contrary, a teacher must learn new roles as a facilitator and enabler of learning opportunities.

Potential biases and limitations of this scoping review

The authors used a blind review process and a systematic search

strategy to control biases in this scoping review. The validity of the results is limited because of the lack of studies using randomised controlled designs as well as the variability in methodological approaches and research designs of the selected studies. This was due to the limited number of high-level scientific studies on the subject of student-centred learning outcomes and benefits in educational institutions. The authors identified numerous papers describing implementations of co-creative learning and allied learning strategies in the context of health care education, but many lacked scientifically rigorous research into the outcomes and benefits of the approach. Including studies referencing concepts such as co-creative learning, students as partners, collaborative learning, inquiry-based learning, cooperative inquiry and co-construction of knowledge as synonyms to describe the type of student-centred learning outlined in the theoretical framework of this review may weaken concept reliability. However, according to Bovill [18] these frameworks have similar features. As anticipated, starting the review from 2010 proved to be relevant in terms of identifying studies that offer the most contemporary findings on the outcomes and benefits of the learning strategies in question. Due to the limited number of studies that remained after all the review steps, and due to the specific nature of the topic, a previously modified set of ten criteria commonly used to evaluate the quality of reporting studies across different methodologies [10,29] was applied. One benefit of using this checklist is that evaluations can be more easily compared across different types of studies, and this evaluation process can be made visible for readers and evaluators.

Conclusion

The results regarding the measurable outcomes of student-centred learning strategies such as collaborative and inquiry-based learning in health care education in higher education institutions are inconclusive. High-quality studies with randomised designs would be necessary for more conclusive results. However, the results of this scoping review suggest that using these approaches seems to improve learning with respect to many generic and health care-specific skills and enhances student satisfaction and motivation.

Acknowledgements

We are grateful for the financial support of the Finnish National Agency for Education for this project. We would also like to thank the AI-based solutions in the dose management ‘Dosis’ project group for innovative ideas regarding student-centred learning methods.

References

1. World Health Organization & JHPIEGO. *Effective teaching: a guide for educating healthcare providers*. World Health Organization. 2005.
2. Clark K, Hoffmann A. Educating Healthcare Students: Strategies to Teach Systems Thinking to Prepare New Healthcare Graduates. *J Prof Nurs*. 2019;35(3):195-200.
3. Hung MSY, Lam SKK, Chow MCM. Nursing students' experiences and perceptions of learner-centred education in a disaster nursing course: A qualitative study. *Nurse Educ Pract*. 2020;47:102829.
4. Healy M, Flint A, Harrington K. Students as Partners: Reflections on a Conceptual Model. *Teaching Learning Inquiry*. 2016;4(2).
5. Carrick, JA. Student achievement and NCLEX-RN success: Problems that persist. *Nurs Educ Perspect*. 2011;32(2):78-83.
6. van Wyngaarden A, Leech R, Coetzee I. Challenges nurse educators experience with development of student nurses' clinical reasoning skills. *Nurse Educ Pract*. 2019;40:102623.
7. Tudor Car L, Kyaw BM, Dunleavy G. Digital Problem-Based Learning in Health Professions: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration. *J Med Internet Res*. 2019; 21(2):e12945.
8. Wosinski J, Belcher AE, Dürrenberger Y, Allin AC, Stormacq C, Gerson L. Facilitating problem-based learning among undergraduate nursing students: A qualitative systematic review. *Nurse Educ Today*. 2018;60:67-74.
9. Jowsey T, Foster G, Cooper-Ioelu P, Jacobs S. Blended learning via distance in pre-registration nursing education: A scoping review. *Nurse Educ Pract*. 2020;44:102775.
10. Metsälä E, Lumme R, Lampi H. Outcome measures and outcomes of blended learning in health care staff education – implications for radiography education. *J Clin Radiogr Radiother*. 2017;1:11-8.
11. Hegland PA, Aarlie H, Strømme H, Jamtvedt G. Simulation-based training for nurses: Systematic review and meta-analysis. *Nurse Educ Today*. 2017;54:6-20.
12. Holmström A. Radiography Students' Learning of Plain X-Ray Examinations in Simulation Laboratory Exercises: An Ethnographic Research. *J Med Imaging Radiat Sci*. 2019;50(4):557-64.
13. Kalb KA, O'Conner-Von SK, Brockway C, Rierson CL, Sendelbach S. Evidence-Based Teaching Practice in Nursing Education: Faculty Perspectives and Practices. *Nurs Educ Perspect* 2015;36(4):212-9.
14. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, Matthews P, ET AL. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Med Teach*. 2012;34(6):e421-e444.
15. Gallegos C, Tesar AJ, Connor K, Martz K. The use of a game-based learning platform to engage nursing students: A descriptive, qualitative study. *Nurse Educ Pract*. 2017;27:101-6.
16. Hill RV, Nassrallah Z. A Game-Based Approach to Teaching and Learning Anatomy of the Liver and Portal Venous System. *MedEdPORTAL* 2018;14:10696.
17. Rønning SB, Bjørkly S. The use of clinical role-play and reflection in learning therapeutic communication skills in mental health education: an integrative review. *Adv Med Educ Pract*. 2019;10:415-25.
18. Bovill C. Co-creation in learning and teaching: the case for a whole-class approach in higher education. *High Educ*. 2020;79(6):1023-37.
19. Phillips L, Napan K. What's in the 'co'? Tending the tensions in co-creative inquiry in social work education. *Int J Qual Stud Educ*. 2016;29(6):827-44.
20. Laal M. Collaborative learning; elements. *Procedia Soc Behav Sci* 2013;83:814-8.
21. Impropal. EU. 2020.
22. Mercer-Mapstone L, Dvorakova SL, Matthews KE, Abbot S, Cheng B, Felten P, et al. A systematic literature review of students as partners in higher education. *IJSaP*. 2017;1(1):1-23.
23. Theobald KA, Ramsbotham J. Inquiry-based learning and clinical reasoning scaffolds: An action research project to support undergraduate students' learning to 'think like a nurse'. *Nurse Educ Pract*. 2019;38:59-65.
24. Napan K. Co-creative learning: creating inclusive processes for learning through co-operative inquiry. 4th Asia Pacific Conference on Educational Integrity (4APCEI) 28–30 September 2009 University of Wollongong NSW Australia 2009.
25. Ahn R, Class M. Student-Centered Pedagogy: Co-Construction of Knowledge through Student-Generated Midterm Exams. *IJTLHE*. 2011;23(2):269-81.
26. Joanna Briggs Institute. *JBI Manual for Evidence Synthesis*. Chapter 10.2.2 Developing the title and question 2020.
27. Strobe Group. STROBE Statement—checklist of items that should be included in reports of observational studies. 2007.
28. Hafslund B, Wammen NM. Mammography screening from the perspective of quality of life: a review of the literature. *Scand J Caring Sci*. 2009;23(3):539-48.
29. Metsälä E, Vaherkoski U. Medication errors in elderly acute care - a systematic review. *Scand J Caring Sci*. 2014;28(1):12-28.
30. Strom B, Pires Jorge J, Meystre NR, Kukkes T, Metsälä E, Hafslund BN. Interprofessional work in early detection of breast cancer: An integrative review. *Radiography*. 2019;25:170-7.
31. Männistö M, Mikkonen K, Vuopala E, Kuivila H-M, Virtanen M, Kyngäs H, et al. Effects of a digital educational intervention on collaborative learning in nursing education: A quasi-experimental study. *Nord J Nurs Res*. 2019;39(4):191-200.
32. Mueller-Joseph LJ, Nappo-Dattoma L. Collaborative learning in pre-clinical dental hygiene education. *J Dent Hyg*. 2013;87(2):64-72.
33. Jackson SC, Bilich LA, Skuza N. The Benefits and Challenges of Collaborative Learning: Educating Dental and Dental Hygiene Students Together. *J Dent Educ*. 2018;82(12):1279-86.
34. Schoening AM, Selde MS, Goodman JT. Implementing Collaborative Learning in Prelicensure Nursing Curricula: Student Perceptions and Learning Outcomes. *Nurse Educ*. 2015;40(4):183-8.
35. Makhoul I, Motwani P, Schafer L. Integrating Collaborative Learning and Competition in a Hematology/Oncology Training Program. *J Cancer Educ*. 2018;33(1):186-92.
36. Männistö M, Mikkonen K, Kuivila HM, Virtanen M, Kyngäs H, Kääriäinen M. Digital collaborative learning in nursing education: a systematic review. *Scand J Caring Sci*. 2020; 34(2):280-92.
37. Sonne Carstensen S, Kjaer C, Möller S, Bloksgaard M. Implementing collaborative, active learning using peer instructions in pharmacology teaching increases students' learning and thereby exam performance. *Eur J Pharmacol*. 2020;867(15):172792.
38. Naylor S. An evaluation of an enquiry based learning strategy for the science of imaging technology Radiography. 2011;17(4):319-22.
39. Rodríguez G, Pérez N, Núñez G, Baños JE, Carrió M. Developing creative and research skills through an open and interprofessional inquiry-based learning course. *BMC Med Educ*. 2019;19(1):134.
40. Zhang J, Cui Q. Collaborative Learning in Higher Nursing Education: A Systematic Review. *J Prof Nurs*. 2018;34(5):378-88.
41. Ignacio J, Chen HC. Cognitive integration in health professions education: Development and implementation of a collaborative learning workshop in an undergraduate nursing program. *Nurse Educ Today*. 2020;90:104436.