

Review

The effectiveness of team-based learning in nursing education: A systematic review

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ARTICLE INFO

Keywords:

Team based learning
Education, nursing
Academic success
Learning outcomes
Systematic review

ABSTRACT

Aim: Team-Based Learning (TBL) is an active teaching methodology, recently implemented also in the field of nursing education. The main objective of this study was to identify, appraise and summarize primary studies on the effectiveness of TBL in achieving learning outcomes in undergraduate nursing students. The secondary objective was to explore the generic competencies the students developed, and their reactions and attitudes.

Study design: A systematic review of experimental and quasi-experimental studies.

Databases sources: Cochrane Library, Pubmed/Medline, Cinahl, PsycINFO, and Eric; Google Scholar was used to search for grey literature and the reference lists of the retrieved papers.

Review methods: A research protocol was developed according to the PRISMA-P guidelines. Two reviewers conducted the selection process. The “JBI Critical Appraisal Checklist” was used to check the quality of the selected studies.

Results: We included 12 studies: 2 monocentric randomized controlled trials and 10 quasi-experimental studies. Nine out of 12 studies produced significant results in favour of TBL in terms of academic performance and skills development, however results were divergent when TBL was compared with other teaching methods. The results of 7 studies highlighted the effectiveness of TBL in improving the development of communication skills, inter-professional learning, and self-directed learning. Divergent results were obtained with regard to problem solving and critical thinking skills. TBL promoted classroom engagement, however it did not seem to be associated with better learning outcomes.

Conclusions: Overall, TBL was found to be effective in achieving undergraduate nursing students’ learning outcomes, but evidence was not sufficiently strong to warrant that it is more effective than other teaching methods. The results of this review are in favour of the implementation of TBL in nursing education, however studies with more rigorous methods and with a mixed method design are required to improve the transferability of results.

1. Introduction

Team-Based Learning (TBL) is a student-centred teaching methodology based on group interaction (Parmelee and Hudes, 2012; Parmelee et al., 2012), recently implemented and becoming widespread in nursing education, because it combines the current European priority to improve the quality of academic education and at the same time save resources [European Association for Quality Assurance in Higher Education (ENQA), 2015]. The latest recommendations of the European Council

urge universities to develop competencies, by redesigning teaching methodologies based on evidence and fostering active learning strategies [European Qualification Framework (EQF), 2018].

In fact, TBL builds on the theoretical paradigms of active learning (Mennenga and Smyer, 2010; Hrynychak and Batty, 2012) and the specific theoretical foundation on which current research in the field of education is based is “The conceptual model of Team-Based Learning” (Michaelsen and Sweet, 2008; Mennenga and Smyer, 2010). According to the theoretical model, learning is described as a constructive process

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<https://doi.org/10.1016/j.nedt.2020.104721>

Received 19 February 2020; Received in revised form 15 November 2020; Accepted 3 December 2020

Available online 11 December 2020

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where students use their knowledge and group interaction to pass tests and resolve problems. From an operational perspective, the learning process consists of 7 phases during which students have to pass three types of tests: an individual test [Individual Readiness Assurance Test (I-RAT)], then the same test but together with the team [Team Readiness Assurance Test (T-RAT)] and practical exercises always together with the team [Team Application (T-APP)]. This process is mediated by a series of determinants, such as the reactions and attitudes of students, where engagement plays a key role, and contributes to the achievement of learning outcomes (Parmelee et al., 2012).

Learning outcomes can be described as what students should know, understand and/or be able to prove at the end of a learning process, in terms of knowledge, skills, and competencies. Competencies can either be specific of a particular discipline or generic (also known as transferable) because they can be in common with several disciplines, and include instrumental competencies (i.e. problem-solving and critical thinking skills), communication and interpersonal skills, and self-directed learning (González and Wagenaar, 2013). According to the recommendations of the European Council regarding the key competencies for lifelong learning (EQF, 2018), for current and future graduates, the knowledge and skills of a single discipline are no longer sufficient to play an active role within highly complex professional contexts, which will increasingly include transferable competencies.

There are a growing number of studies regarding the effectiveness of TBL in undergraduate courses for health professions (Chen et al., 2018; Fatmi et al., 2013; Haidet et al., 2014; Reimschisel et al., 2017; Sisk, 2011), but to our knowledge there are no systematic reviews that evaluate the learning outcomes and the specific competencies in the field of nursing. In addition, there are no systematic reviews that evaluate the effectiveness of learning in terms of transferable competencies.

Starting from the theoretical-conceptual foundation outlined above, we conducted a systematic review with the purpose to identify, appraise, and summarize primary studies focusing on the effectiveness of TBL in the education of undergraduate nursing students.

Therefore, the questions that guided this systematic review were:

- Is TBL in undergraduate nursing courses effective in facilitating the achievement of the targeted learning outcomes?
- Which generic competencies are developed through TBL?
- What were the students' reactions and attitudes following the use of TBL?

2. Methods

2.1. Definition of the research question and the study protocol

To identify the key words and define an appropriate research strategy for the aim of this study, the research question was structured according to the PICOS method and a systematic review protocol was developed according to the PRISMA-P guidelines (Moher et al., 2015; Shamseer et al., 2015).

P: Students attending an undergraduate course in nursing.

I: Team-Based Learning.

C: Comparisons with other teaching methods.

O: Primary outcomes: learning outcomes; Secondary outcomes: students' attitudes and reactions.

S: Experimental and quasi-experimental studies.

2.2. Eligibility criteria

2.2.1. Inclusion criteria

The inclusion criteria described below are based on the PICOS:

- *Population*: students attending an academic undergraduate nursing course. With regard to nursing academic courses, titles, qualifications and the characteristics of university students there are

differences between countries. However, to be included, study participants have to be described as students of undergraduate academic nursing courses.

- *Intervention*: Team-Based Learning structured and methodologically defined according to the principles and the methodological phases of the model originally proposed by Michaelsen and Sweet (2008) and developed in the field of nursing education by Mennenga and Smyer (2010), implemented in any subject of an undergraduate nursing educational program.
- *Comparison*: with other teaching methods.
- *Outcomes*: studies that assess learning outcomes as the measurable result of a learning experience. Students' attitudes and reactions, such as engagement, satisfaction, and accountability are considered as secondary outcomes.
- *Study type*: experimental or quasi-experimental studies (non-randomized controlled trials or pre-post studies without a control group). In addition, also mixed-method studies with a control group or studies that during their quantitative phase measured the outcomes before and after the intervention were included.
- Studies published in Italian or English.

2.2.2. Exclusion criteria

- Studies where the study design is not included (i.e. qualitative or descriptive studies), not stated or unclear, and study protocols.
- Studies involving students attending other educational courses or nursing courses held in non-academic settings.
- Studies where the implementation of TBL was not clearly described, incomplete or modified, and distance learning courses.
- Studies that do not include the learning outcomes as research variables or where the learning outcomes are evaluated exclusively in qualitative terms or described in terms of attitudes, perceptions or students' opinions, and measured exclusively through self-reporting tools.

No publication year limits have been included considering the recent introduction of TBL in nursing education and the absence of previous systematic reviews in the field of nursing.

2.3. Search strategies and study selection process

The Cochrane Library, Pubmed/Medline, Cinahl, PsycINFO and Eric databases were searched to retrieve the primary studies. A strategy based on increasing complexity was adopted to balance sensitivity and specificity, starting with an initial search that used general terms and subsequently with advanced search strings including both free-text words and terms indexed in the database Thesaurus.

Free-text words and indexed terms relevant to the same component of the research question (population, intervention and outcomes) were combined with one another using the Boolean operator OR, whereas terms relevant to different components were joined using the AND operator. The specific search strategy used to search the Pubmed/Medline database is shown in Appendix 1 (online material).

The databases were searched starting from March 2019 and the last search was performed in July 2019. Every search string was saved using the respective personal account, which enabled to receive for each string the updates of newly included studies.

In addition to electronic databases, also the reference lists of the retrieved papers were searched, and Google Scholar was used to search for grey literature. All the retrieved papers were uploaded onto Mendeley, which enabled to collect, manage and compare (identify and remove duplicates) the retrieved papers.

With regard to the study selection process, one member of our review team conducted the initial search and screening activities by examining the titles and abstracts of the identified references and searched for any duplicates. Two members of our review team checked the eligibility of

the full texts of potentially relevant papers.

2.4. Procedures and criteria to appraise the methodological quality of included studies, and data extraction and synthesis

For each included study, the following data were extracted: authors and year of publication, context and language, aim/research question, study design, population, intervention (teaching methodology, contents, intensity/duration), outcomes, methods and instruments for data collection, and results (see Table 1).

The methodological quality of all the included studies was checked by using the Joanna Briggs Institute (JBI, 2017a; 2017b) critical appraisal checklist. A member of our review team extracted the data and conducted the critical appraisal of the included studies. Another member checked the extracted data and the critical appraisals made with the JBI checklists.

3. Findings

A total of 12 primary studies were selected. The flow chart of the entire study selection process is illustrated in Fig. 1.

The references of the full texts assessed for eligibility and the reasons for their exclusion are in Appendix 2 (online material).

3.1. Characteristics of included studies

The main characteristics of the included studies are summarized in Table 1. We included 2 monocentric randomized controlled trials (RCTs), 6 non-randomized controlled trials, and 4 pre-post studies without a control group.

Population: the included studies enrolled a total of 2482 participants, the sample size in each study ranged from a minimum of 40 to a maximum of 425 students. In all of the included studies, the participants were nursing students attending undergraduate university courses. One study included nursing students attending an interprofessional education program (Wong et al., 2017).

With regard to the countries of the included studies, 4 were conducted in universities of South Korea, 4 in the United States, 2 in Taiwan, 1 in Italy, and 1 in Hong Kong.

Intervention: in all of the included studies, TBL was implemented according to the principles and the main methodological phases of the conceptual model. In one study, TBL was combined with simulation (Kang et al., 2016).

In the included studies, TBL was implemented for varying lengths of time, ranging from a single session up to courses that lasted for a whole semester. Moreover, in the majority of the included studies (9 out of 12) TBL was implemented in teaching courses that were specifically for nursing students.

Comparison: in 4 studies TBL was compared with face-to-face lessons; in 3 studies face-to-face lessons were combined with other teaching methods, like case-based discussion and work in small groups; in one study TBL combined with simulation, was compared with simulation alone.

Outcomes: in 11 studies the learning outcomes were assessed in terms of academic performance (results of exams and/or I-RATs or T-RATs). Clinical performance was assessed in 3 studies through the use of checklists. Seven of the 12 included studies assessed generic competencies in terms of learning outcomes: instrumental competencies (i.e. problem-solving and critical thinking), communication and interpersonal skills (i.e. communication skills, self-leadership, interprofessional learning skills, and teamwork) and self-directed learning (or self-learning skills).

3.2. Critical appraisal of included studies

The results of the critical appraisal of the experimental and quasi-

experimental studies are summarized in Tables 2 and 3. In brief, the main limits of the experimental studies were the small sample sizes, which in both studies were smaller than the statistical calculation, the lack of blinding and expectation bias, and their short duration.

With regard to the quasi-experimental studies, in 2 the research question showed internal inconsistency and therefore it was not clear which was the independent variable. In 6 of the included studies, the design involved a non-equivalent control group, and in 3 studies no data were collected at baseline, therefore it was not possible to exclude that differences in the results were determined by confounding factors. In addition, power analysis to determine sample size was conducted in only 2 studies. Four of the included studies had a pre-post design with only a single set of participants; the main limit of these studies was that the effects could be due to other factors that the pre-post design cannot control. The only study where a covariance analysis that breaks down the variance of an outcome (i.e. a dependent variable) into two components (i.e. variance due to the independent variable and variance due to other causes) was the one by Cheng et al. (2014a).

The absence of follow up and reporting limits were found in all of the included papers.

3.3. Learning outcomes

In all of the included studies, at least two different outcomes were assessed, of which at least one was measured quantitatively and not exclusively through self-reporting tools. The summary of the study results in relation to their outcomes is shown in Table 4. In 9 of the 12 studies, significant results were found in favour of TBL in terms of examination scores. In 5 studies, the examination scores were significantly higher following the implementation of TBL compared to the scores obtained from groups that received exclusively traditional lessons (El-Banna et al., 2020: 97.11 vs 88.62, $p < 0.001$; Harmon and Hills, 2015: 939.8 vs 843.6, $p < 0.001$; Raso et al., 2018: 50% vs 37%, $p = 0.0003$) or associated with other teaching methods like case-based discussion (Kim et al., 2016: 164.7 vs 145.2, $p < 0.001$) and group work (Whittaker, 2015: 0.788 vs 0.756, $p = 0.003$). In two studies, where TBL was compared with traditional teaching methods (Mennenga, 2013: $F = 0.009$, $p = 0.0923$) and with simulation (Kang et al., 2016: 10.51 vs 8.98, $p = 0.071$), there were no statistically significant differences. In the study by Kang et al. (2016), significant scores were obtained only by those who had lower scores in the pre-test (5.20 vs 2.55, $p = 0.002$). Also Raso et al. (2018) found that significant difference pre-and post-intervention in the exam's score was obtained in the population of weaker students (24.6% vs 10%, $p = 0.0003$). The findings of the quasi-experimental studies without control groups showed that the scores of the exams were significantly higher than those of the individual tests (I-RAT) (Cheng et al., 2014a: 79.04 vs 64.32, $p < 0.001$; Cheng et al., 2014b: 65.70 vs 92.86, $p < 0.001$; Park et al., 2015: 80.47 vs 96.44, $p < 0.001$; Wong et al., 2017: 43.00 vs 76.03, $p < 0.001$). The results of 3 studies highlighted that TBL was more effective in developing clinical performance skills compared to traditional teaching methods (Lee, 2018: 75.28 vs 72.18, $p = 0.014$; Kim et al., 2016: 22.3 vs 16.3, $p < 0.001$) but when compared only with simulation, there were no significant differences (Kang et al., 2016: 72.10 vs 66.90, $p = 0.098$). In addition to academic and clinical performance, 7 of the 12 included studies assessed also the generic competencies as learning outcomes. What emerged from the results of these studies was that TBL was effective in developing communication and interprofessional collaboration competencies (Park et al., 2015: 32.12 vs 35.50, $p < 0.001$; Wong et al., 2017: 4.07 vs 4.18, $p = 0.014$) and self-directed learning (Cheng et al., 2014a: 75.88 vs 73.74, $p < 0.001$; Cheng et al., 2014b: 78.34 vs 75.91, $p < 0.001$), and the effectiveness was greater compared to traditional lessons (Lee, 2018: 60.62 vs 57.86, $p = 0.007$) even when associated with work in small groups (Whittaker, 2015: 2625.8 vs 1533.5, $p < 0.001$). Instead, contrasting results were obtained with regard to problem solving and critical thinking skills (Lee, 2018: 101.60 vs

Table 1
Characteristics of included studies.

Authors, year of publication	Context and language	Aim/Research question	Study design	Population	Intervention (teaching method, contents, intensity/duration)	Outcomes, data collection methods and tools	Results
Cheng et al., 2014a	Taiwan, in English	To evaluate the effects of TBL on students' behaviours and learning outcomes in undergraduate nursing courses. Research questions: (a) What are the effects of TBL on student engagement in class, value of teams, self-directed learning and on perceived core nursing competencies? (b) What is the effect of TBL on students' academic performance? (c) What are the effects of TBL on engagement in class, value of teams, self-directed learning and on generic nursing competencies compared to the various demographic variables?	Pre-Post study with no control group	N = 387 (231 first-year students in, Registered Nurse-Bachelor of Science in Nursing; 156 second and third-year students attending the same undergraduate course)	TBL conducted in first-year subjects of the undergraduate course in maternal-child nursing and adult health nursing and in subjects of the second and third year of the course in medical-surgical nursing and in community health nursing	<u>Outcomes:</u> engagement, value of teams, self-directed learning, generic competences in nursing, academic achievement. <u>Data collection methods and tools:</u> 4 validated questionnaires were administered before and after the intervention: "The Classroom Engagement Survey" (Haidet et al., 2002), "Value of Teams" (Haidet et al., 2002), "Self-Directed Learning Instrument" (Cheng et al., 2010), "Nursing Eight Core Competencies Scale" (TNAC). Academic achievement was assessed through RAT scores and the final examination scores	Results were statistically significant for pre- and post-intervention in classroom engagement (34.25 vs 35.31, $p < 0.001$) and self-directed learning (73.74 vs 75.88, $p < 0.001$) in favour of TBL, but not for core competencies in nursing. Significant differences for value of teams were found only in post-graduate courses (65.06 vs 66.44, $p = 0.001$). T-RAT scores (M = 88.64) and final examination scores (M = 79.04) were significantly higher than I-RAT scores (M = 64.32) ($p < 0.001$)
Cheng et al., 2014b	Taiwan, in English	To evaluate the effects of TBL on learning outcomes in a Maternal-Child Nursing course in Taiwan. Questions guiding the study: Does TBL influence the students' level of classroom engagement, value of team learning and self-directed learning? Is there a correlation between level of engagement, value of teams and self-directed learning achieved and demographic variables? Does TBL affect students' academic performance?	Pre-Post study with no control group	N = 207 students of 2 different cohorts (104 of the 2011 academic year cohort and 103 of the 2012 academic year cohort)	18 TBL sessions (of 2 h each) applied to a subject in a Maternal-Child Nursing course	<u>Outcomes:</u> engagement, value of teams, self-directed learning, academic achievement. <u>Data collection methods and tools:</u> 3 validated questionnaires administered before and after the intervention: "The Classroom Engagement Survey" (Haidet et al., 2002), "Value of Teams" (Haidet et al., 2002), "Self-Directed Learning Instrument" (Cheng et al., 2010). Academic performance was assessed through RAT scores and final examination scores	Results showed statistically significant differences between the pre- and post-intervention scores for classroom engagement, value of teams and self-directed learning, in favour of TBL (engagement: 35.54 vs 36.46, $p < 0.001$; value of teams: 64.60 vs 65.72, $p = 0.003$; self-directed learning: 75.91 vs 78.34, $p < 0.001$); the levels of value of teams and self-directed learning increased significantly especially in those who had positive expectations, expressed interest and obtained good scores during the course. The mean scores of the T-RAT and of the final examinations were significantly higher than those of the I-RAT (65.70 vs 92.86, $p < 0.001$)
El-Banna et al., 2020	USA, in English	To compare the differences between the learning outcomes of nursing students who attended the pharmacology course with a traditional lecture-based approach and those who attended the same	Non-randomized controlled Trial	N = 338 students of the Accelerated Bachelor of Science in Nursing of the same year divided into 5 cohorts. (IG = 228; CG = 110)	IG: Pharmacology courses reduced to 3 credits, 2 held with traditional lessons and 1 with the TBL method; CG: a 4-credit pharmacology course held with traditional lessons	<u>Outcomes:</u> the final examination scores of the course. <u>Data collection methods and tools:</u> data were collected at the end of the course using a test with 60 multiple-choice questions and a	TBL produced a positive impact on the learning outcomes. There were significant differences between IG and CG, in favour of TBL, both with regard to the scores of the test (97.11 vs 88.62, $p < 0.001$) and the

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Table 1 (continued)

Authors, year of publication	Context and language	Aim/Research question	Study design	Population	Intervention (teaching method, contents, intensity/duration)	Outcomes, data collection methods and tools	Results
		course with the TBL approach				standardized test according to specific criteria administered by an external examination board	standardized test (62.17 vs 59.79, $p < 0.001$)
Harmon and Hills, 2015	USA, in English	To evaluate the effect of team-based learning on learning outcomes in an undergraduate psychiatric mental health nursing course	A quasi-experimental study with a non-equivalent control group	N = 347 (IG= 174 students who attended the course from 2012 to 2014; CG=173, students who attended the course from 2010 to 2012)	IG: an undergraduate psychiatric mental health nursing course conducted with the TBL method in the first and second semester in the years between 2012 and 2014; CG: an undergraduate psychiatric mental health nursing course conducted with traditional lessons for each semester in the years between 2010 and 2012	<u>Outcomes</u> : final examination scores and study time. <u>Data collection methods and tools</u> : at the end of the course the “Evolve ®PMH practice exit examination” and the questionnaire “Student Self-Report of Time Spent (in hours) in Course Preparation” were administered	The scores of the Evolve ®PMH practice examination statistically improved after implementing TBL (IG: 939.8 vs CG 843.6, $p < 0.001$); also the declared amount of study time was higher in the IG compared to the CG
Kang et al., 2016	South Korea, in English	To determine the effect of simulation with team-based learning compared to simulation alone in a course of new-born nursing care	Randomized controlled trial (RCT)	N = 74 nursing students (IG: 37; CG: 37)	IG: 1 lesson of a course of newborn nursing care of 15 weeks conducted in simulation associated with TBL (divided into Phases: 1. TBL-preparation phase; 2. SIMULATION -orientation phase; 3. SIMULATION -simulation phase; 4. TBL-application phase; CG: lessons of the same course conducted only with SIMULATION (phases 1., 2., 3.)	<u>Outcomes</u> : learning attitudes, academic achievement, simulation performances. <u>Data collection methods and tools</u> : at the beginning and at the end of the course all participants were administered the “Learning Attitude Tool” (LA) (Korean Educational Development Institute, 1991) to evaluate learning attitude towards theory and practice in new-borns nursing care. Learning outcome 1 (LO1) was a written evaluation (20 multiple-choice questions) used to identify TBL levels of academic achievement. Learning outcome 2 (LO2) was a checklist for simulation performance evaluation used to identify students’ ability to care for healthy new-borns	There were no significant differences between the 2 groups in the scores of LA (0.05 vs -0.04, $p = 0.324$) and LO2 (66.90 vs 72.10, $p = 0.098$); instead significant differences between the 2 groups, in favour of TBL were reported in the LO1 scores in those who obtained the lowest scores in the pre-test (5.20 vs 2.55, $p = 0.002$)
Kim et al., 2016	South Korea, in English	To examine the effects of TBL on problem solving ability and learning outcomes (knowledge and clinical performance) of nursing students	Randomized controlled trial (RCT)	N = 63 third-year undergraduate nursing students (IG = 32, CG = 31)	IG: course in nursing (not specified) of 3 weeks conducted with the TBL method; CG: same course conducted with the method of traditional lessons and case-based discussion	<u>Outcomes</u> : problem solving, knowledge and clinical performance. <u>Data collection methods and tools</u> : at the end of the 3-week course the “Problem-Solving Scale for Clegge Nursing” (Lee et al., 2003), a 20-item multiple-choice questionnaire and a 13-item clinical performance checklist were administered	At the end of the 3-week course, the problem-solving skills scores in the IG were significantly higher than the CG (164.7 vs 145.2, $p < 0.001$). Significant differences, in favour of TBL, were reported also for the level of acquired knowledge (13.6 vs 12.0, $p = 0.016$) and for clinical performance (22.3 vs 16.3, $p < 0.001$)
Lee, 2018	South Korea, in English	To compare the effectiveness of TBL with lecture-style	A pre-post quasi-experimental	N = 183 Nursing students randomly assigned either to IG	IG: course in adult health nursing conducted with three TBL sessions of 2 h	<u>Outcomes</u> : core competences, clinical competence skills,	The intervention group (IG) obtained significantly higher

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Table 1 (continued)

Authors, year of publication	Context and language	Aim/Research question	Study design	Population	Intervention (teaching method, contents, intensity/duration)	Outcomes, data collection methods and tools	Results
		classes in developing core competencies in nursing education	study with a non-equivalent control Group	or CG. (IG = 95, CG = 88)	each; CG: course in adult health nursing conducted with 3 lecture-style classes of 2 h each	problem solving ability, communication competence, critical thinking ability, self-leadership. <u>Data collection methods and tools:</u> the following validated tools were administered pre-post intervention to all the study participants: clinical competences skills instrument (Yang and Park, 2004), problem-solving ability instrument (Park and Woo, 1999), Global Interpersonal Communication Competence Scale (Hur, 2003), critical thinking disposition instrument (Yoon, 2004), The Revised Self-Leadership Questionnaire (Shin et al., 2009)	scores for clinical competence skills (67.80 vs 75.28, $p < 0.001$), communication competence (56.20 vs 60.62, $p < 0.001$), critical thinking ability (96.18 vs 101.60, $p < 0.001$) and self-leadership ability (125.83 vs 132.01, $p = 0.001$) in the post-test, whereas the CG obtained significantly higher scores for clinical competence skills and critical thinking ability in the post-test than in the pre-test. After the intervention, the IG had levels of clinical competence (75.28 vs 72.18, $p = 0.014$), communication competence (60.62 vs 57.86, $p = 0.007$) and self-leadership ability (132.01 vs 126.73, $p = 0.25$) significantly higher than the CG. Results showed significant differences, in favour of the IG, for levels of engagement ($p < 0.001$), but not for final examination scores. The levels of engagement were not significantly associated with examination results
Mennenga, 2013	USA, in English	To compare TBL with traditional lectures with regard to student engagement and performance of examinations in nursing students	Non-randomized controlled Trial	N = 143, nursing students (IG = 69, CG = 74)	IG: 6 TBL sessions conducted during a course of 3 credits in community nursing in 2010; CG: traditional lessons alternated with case-based discussions and activities in small groups conducted in the same course during the previous semester, 2009	<u>Outcomes:</u> student engagement, examination scores, accountability, student satisfaction, preference for lecture or TBL. <u>Methods and assessment tools:</u> at the end of the course all the study participants were administered the "Classroom Engagement Survey" (U.S. Department of Education, Fund for the Improvement of Postsecondary Education, 2003); also the "Team-Based Learning Student Assessment Instrument (Mennenga, 2012) was administered to the IG. The I-RAT and T-RAT scores and the final examination scores were also collected	Results showed statistically significant advances in the scores for perceived teamwork and team skills (team-adaptability skills and team-interpersonal skills) after introducing TBL (32.12 vs 35.50, $p < 0.001$; 29.01 vs 32.45,
Park et al., 2015	South Korea, in English	To examine the effectiveness of team-based learning on nursing students' perceived teamwork and academic performance (individual, team readiness assurance tests and examination scores)	Pre-Post study with no control group	N = 74 second-year nursing students	16 TBL sessions applied in a 2-credit health assessment course	<u>Outcomes:</u> teamwork (team-efficacy and team-adaptability and interpersonal skills); academic achievement (I-RAT, T-RAT and examination scores); <u>Data collection methods and tools:</u> 2 assessment scales: Students' perceived teamwork (perceived	Results showed statistically significant advances in the scores for perceived teamwork and team skills (team-adaptability skills and team-interpersonal skills) after introducing TBL (32.12 vs 35.50, $p < 0.001$; 29.01 vs 32.45,

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Table 1 (continued)

Authors, year of publication	Context and language	Aim/Research question	Study design	Population	Intervention (teaching method, contents, intensity/duration)	Outcomes, data collection methods and tools	Results
						team efficacy); and Students' perceived team skills (team-adaptability skills scale and team-interpersonal skills scale), developed by Marshall (2003) , translated and modified by Kwon (2010) were administered pre- and post-intervention.	$p < 0.001$; 43.41 vs 48.04, $p < 0.001$). In particular, there was an association between team-efficacy and interpersonal skills and team-adaptability. With regard to academic performance, T-RAT scores were significantly higher than I-RAT scores (96.44 vs 80.47, $p < 0.001$). The I-RAT scores were associated with final examination scores ($p < 0.001$), whereas T-RAT scores were associated with team-efficacy and interpersonal skills ($p = 0.001$)
Raso et al., 2018	Italy, in Italian	Evaluate the educational impact of TBL in the undergraduate nursing degree course in Turin and test the applicability of TBL from the teachers' perspective and students' appreciation	Non-randomized controlled Trial	N = 425 first-year undergraduate nursing students (IG = 206 students attending in 2011; CG = 219 students attending in 2010)	IG: 5 TBL sessions conducted during the course of Clinical Nursing I and II in October–December 2010; CG: traditional classes conducted during the same course in previous year (October–December 2009)	<u>Outcomes:</u> final examination scores (written test with multiple-choice questions) of the course and method appreciation. <u>Data collection methods and tools:</u> the written examination scores of the 2 groups were compared; to assess method appreciation at the end of the exam students were asked to complete a questionnaire used in the pilot phase of the study	Overall, the test showed that TBL improved students' exam performance. In fact, there was a statistically significant increase in the number of students that answered correctly to more than 80% of the exam questions (37% in 2010 vs 50% in 2011, $p = 0.0003$). In addition, the TBL method was greatly appreciated by the students, who felt more involved and preferred it to traditional classes
Whittaker, 2015	USA, in English	To examine the effectiveness of TBL on the learning outcomes in a course of evidence-based practice and mixed nursing research (online and in aula)	A quasi-experimental, non-randomized, post-test only design	N = 184 nursing students (IG N = 86, CG = 98)	IG: 1 TBL session CG: traditional lesson and work in small groups. Both for the CG and the IG the course lasted 90 min and with pre-class online lessons	<u>Outcomes:</u> Self-regulated learning and final examination scores. <u>Data collection methods and tools:</u> self-regulated learning was measured by the amount of time the students spent participating in pre-class online learning activities and by course examination scores	IG students showed significantly higher levels of self-directed learning regarding the online course activities (2625.8 vs 1533.5 seconds, $p < 0.001$) and the final examination scores of the course (0.788 vs 0.756, $p = 0.003$)
Wong et al., 2017	Hong Kong, in English	To examine the effects of interprofessional team-based learning for undergraduate nursing students in terms of knowledge level, readiness for interprofessional learning, team learning and perceived collective efficacy	Pre-Post study with no control group	N = 40 nursing students	1 TBL session conducted in a multidisciplinary course	<u>Outcomes:</u> knowledge level, attitude towards interprofessional team-based learning and perceived collective efficacy. <u>Data collection methods and tools:</u> all participants were administered pre- and post-intervention 3 questionnaires: "Readiness for Interprofessional Learning Scale", "Attitudes Towards	A statistically significant improvement in knowledge level was obtained from the T-RAT scores, compared to the I-RAT scores (43.00 vs 76.03, $p < 0.001$), for attitudes towards interprofessional learning and team learning, and for perceived collective efficacy ($p < 0.001$)

(continued on next page)

Table 1 (continued)

Authors, year of publication	Context and language	Aim/Research question	Study design	Population	Intervention (teaching method, contents, intensity/duration)	Outcomes, data collection methods and tools	Results
						Various Aspects of Team Learning”, Perceived Collective Efficacy. Also the I-RAT and T-RAT scores were collected to assess the level of knowledge	

IC: Intervention Group.
CG: Control Group.

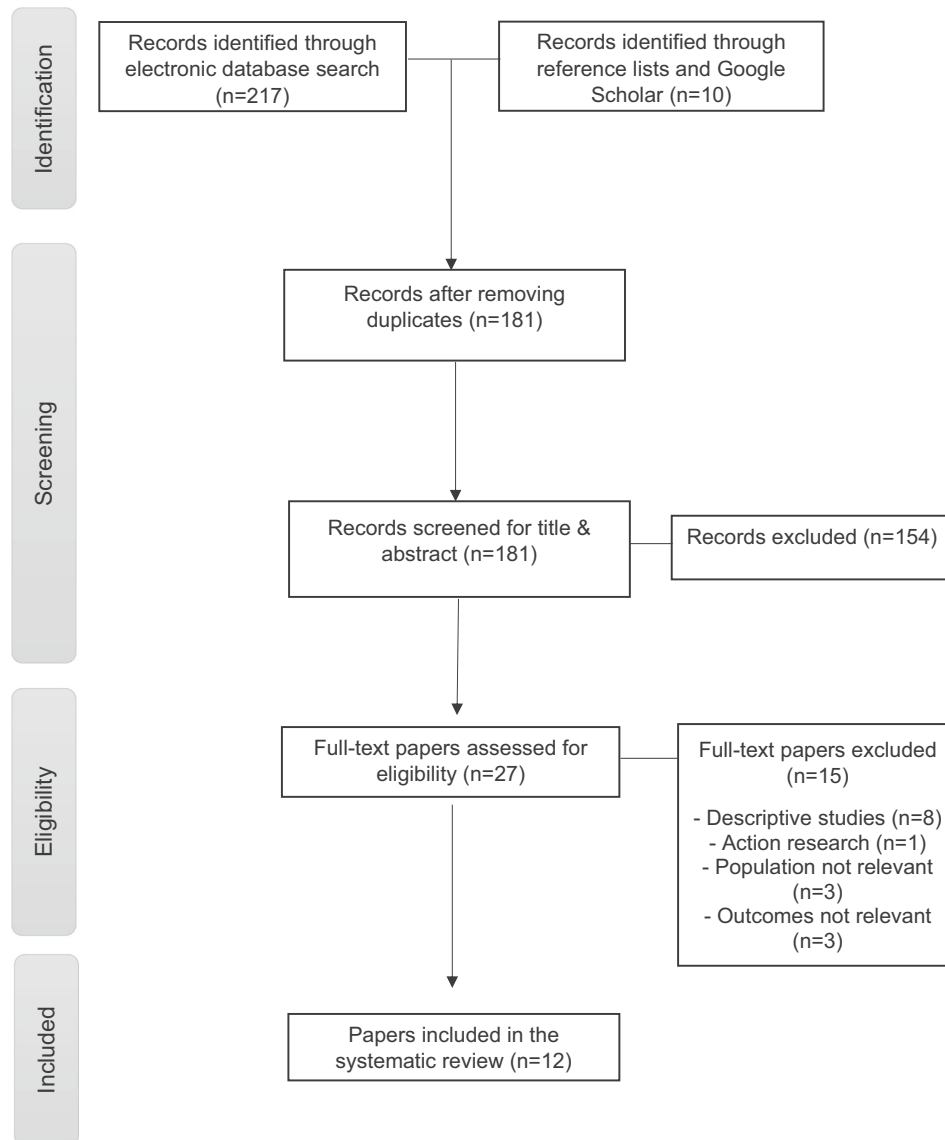


Fig. 1. Flow chart of the literature search (Moher et al., 2015).

99.03, $p = 0.127$; Kim et al., 2016: 164.7 vs 145.2, $p < 0.001$).

3.4. Students' reactions and attitudes

The reactions and attitudes that the implementation of TBL triggered in students constitute process evaluation endpoints that influence the achievement of the learning outcomes, sometimes in a decisive manner.

Of all the students' reactions and attitudes, the most investigated one (3 out of 12 studies) was classroom engagement. In all of these three studies, classroom engagement was measured using the "Classroom Engagement Survey", a structured and validated self-reporting questionnaire (Haidet et al., 2002), through which encouraging results in favour of TBL emerged, and through which more statistically significant results were obtained also compared to traditional teaching methods,

Table 2

Critical appraisal of the included experimental studies (JBI Critical Appraisal Checklist for Randomized Controlled Trials).

References	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Kang et al. (2016)	Y	UC	UC	NA	NA	N	Y	N	Y	Y	Y	Y	Y
Kim et al. (2016)	Y	UC	Y	NA	NA	N	UC	N	Y	Y	Y	Y	Y
% Y	100%	Zero	50%	Zero	Zero	Zero	50%	Zero	100%	100%	100%	100%	100%

Y = yes; N = no; UC = unclear; NA = not applicable; JBI Critical Appraisal Checklist for Randomized Controlled Trials: Q1 = Was true randomization used for assignment of participants to treatment groups?; Q2 = Was allocation to treatment groups concealed?; Q3 = Were treatment groups similar at the baseline?; Q4 = Were participants blind to treatment assignment?; Q5 = Were those delivering treatment blind to treatment assignment?; Q6 = Were outcomes assessors blind to treatment assignment?; Q7 = Were treatment groups treated identically other than the intervention of interest?; Q8 = Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?; Q9 = Were participants analyzed in the groups to which they were randomized?; Q10 = Were outcomes measured in the same way for treatment groups? Q11 = Were outcomes measured in a reliable way? Q12 = Was appropriate statistical analysis used? Q13 = Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

Table 3

Critical appraisal of the included quasi-experimental studies (JBI Critical Appraisal Checklist for Quasi-Experimental Studies).

References	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Cheng et al. (2014a)	Y	Y	Y	N	Y	N	Y	Y	Y
Cheng et al. (2014b)	Y	Y	Y	N	Y	N	Y	Y	Y
El-Banna et al. (2020)	Y	UC	Y	Y	N	N	Y	Y	Y
Harmon and Hills (2015)	Y	UC	Y	Y	N	N	Y	UC	Y
Lee (2018)	Y	Y	Y	Y	Y	N	Y	Y	Y
Mennenga (2013)	Y	UC	UC	Y	N	N	UC	Y	Y
Park et al. (2015)	Y	Y	Y	N	Y	N	Y	Y	Y
Raso et al. (2018)	Y	UC	UC	Y	N	N	UC	N	Y
Whittaker (2015)	UC	Y	Y	Y	N	N	Y	UC	Y
Wong et al. (2017)	UC	Y	Y	N	Y	N	Y	Y	Y
% Y	80%	60%	70%	60%	50%	Zero	80%	70%	100%

Y = yes; N = no; UC = unclear; NA = not applicable; JBI Critical Appraisal Checklist for Quasi-Experimental Studies: Q1 = Is it clear in the study what is the “cause” and what is the “effect” (i.e. there is no confusion about which variable comes first)?; Q2 = Were the participants included in any comparisons similar?; Q3 = Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?; Q4 = Was there a control group?; Q5 = Were there multiple measurements of the outcome both pre and post the intervention/exposure?; Q6 = Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?; Q7 = Were the outcomes of participants included in any comparisons measured in the same way?; Q8 = Were outcomes measured in a reliable way?; Q9 = Was appropriate statistical analysis used?

like face-to-face lessons (Cheng et al., 2014a: 34.25 vs 35.31, $p < 0.001$; Cheng et al., 2014b: 35.54 vs 36.46, $p < 0.001$; Mennenga, 2013: 30.03 vs 21.31, $p < 0.001$). However, high levels of engagement were not significantly associated with academic performance outcomes (Mennenga, 2013), therefore not confirming Haidet et al.'s (2008) hypothesis according to which higher levels of engagement positively influence learning outcomes. Mennenga (2013), in addition to engagement, also assessed accountability, student satisfaction and their preferences between TBL and traditional lectures. After the TBL intervention, students exhibited high levels of accountability (35.5, SD = 3.87), and overall satisfaction (30.29, SD = 6.52), but did not prefer TBL to traditional lectures (47.84, SD = 9.63). With regard to ‘value of teams’ and ‘learning attitudes’, diverging results were found. Two studies assessed the ‘value of teams’ by using the same “Value of Teams” self-reporting tool developed and validated by Haidet et al. (2002). Cheng et al. (2014a) found significant differences for this outcome in favour of TBL only in the second- and third-year students of the courses of medical-surgical nursing and community health nursing (65.06 vs 66.44, $p < 0.001$), but not in the first-year students attending the course in maternal-child nursing and adult health nursing (61.17 vs 61.0, $p = 0.77$) where TBL had been implemented. Cheng et al. (2014b), with a sample and context very similar to the one just described (first-year students attending a course in maternal-child nursing in Taiwan) obtained significant results in favour of TBL with regard to this outcome (65.72 vs 64.60, $p = 0.003$).

4. Discussion

The aim of the present systematic review was to evaluate the effectiveness of TBL in favouring the achievement of learning outcomes in

undergraduate nursing students.

Overall, results showed that TBL was effective in achieving the learning outcomes, however this evidence was not sufficiently strong in supporting the major effectiveness of TBL compared to other teaching methods.

4.1. The effectiveness of TBL in nursing academic performances and clinical skills

Most of the studies conducted in the field of Nursing education evaluated the effectiveness of TBL by using academic performance as the outcome, measured in terms of exam results. Nine studies obtained significant results in favour of TBL. However, results were divergent when compared with other teaching methods: on one hand, 5 studies reported significant differences in favour of TBL compared to traditional teaching methods; on the other, 2 studies did not highlight statistically significant improvements. These results are in line with what emerged from the literature in a larger sample of students attending courses for health professionals (Chen et al., 2018; Fatmi et al., 2013; Reimschisel et al., 2017; Sisk, 2011).

Another finding confirmed by many studies is that TBL appeared to be helpful for students whose academic performance was weak, providing evidence that students with lower marks were the ones who benefited most from TBL in improving their learning outcomes (Haidet et al., 2014; Reimschisel et al., 2017; Sisk, 2011). However, when interpreting these results, we must also consider that it is reasonable to expect that I-RAT scores are lower than T-RAT scores because they are taken by a group of people who can discuss together about the answers and exchange their ideas.

In the field of nursing education, there are no data on the

Table 4
Summary of the results of the included studies.

Learning outcomes	Authors, year of publication	Length of the interventions	Evaluation period	Assessment instruments	Intervention	Comparison	$p > 0.05$ or not stated	$p < 0.05$	Study design and population
Examination scores	Cheng et al., 2014a	4 nursing subjects of the undergraduate course	At the end of each course	RAT scores and the final examination scores	TBL			In favour of TBL	NCG (N = 387)
	Cheng et al., 2014b	A Maternal-Child Nursing course (18 weeks) implemented for the first time in 2011 and for the second time in 2012	At the end of the course	RAT scores and the final examination scores	TBL			In favour of TBL	NCG (N = 207)
	El-Banna et al., 2020	A Pharmacology course of 5 credits	At the end of the course	Test with 60 multiple-choice questions and a standardized test according to specific criteria administered by an external examination board	TBL	Traditional lectures		In favour of TBL	NRCT (N = 338)
	Harmon and Hills, 2015	An undergraduate psychiatric mental health nursing course applied for four years in different cohorts of students	At the end of each course for each cohort of students	Evolve ®PMH practice exit examination	TBL	Traditional lectures		In favour of TBL	NRCT (N = 347)
	Kang et al., 2016	A course of newborn nursing care of 15 weeks	Before and after the course	A written evaluation (20 multiple-choice questions)	TBL associated with simulation	Simulation	No significant differences		RCT (N = 74)
	Kim et al., 2016	A course in nursing of 3 weeks	At the end of the course	20-item multiple-choice questionnaire	TBL	Traditional lectures and case-based discussion		In favour of TBL	RCT (N = 63)
	Mennenga, 2013	A course of 3 credits in community nursing applied for the first time in 2009 and for the second time in 2010	During and after the course	The I-RAT and T-RAT scores and the final examination scores	TBL	Traditional teaching methods	No significant differences		NRCT (N = 143)
	Park et al., 2015	A 2-credit health assessment course	During and after the course	I-RAT, T-RAT and examination scores	TBL			In favour of TBL	NCG (N = 74)
	Raso et al., 2018	A clinical nursing course applied for the first time in October–December 2009 and for the second time in October–December 2010	At the end of the course	Final examination scores (written test with multiple-choice questions)	TBL	Traditional lectures		In favour of TBL	NRCT (N = 425)
	Whittaker, 2015	A course that lasted 90 min and with pre-class lessons	At the end of the course	Final examination scores	TBL	Traditional lecture sand work in small groups		In favour of TBL	NRCT (N = 184)
Clinical competence skills	Wong et al., 2017	A multidisciplinary course	During the course	the I-RAT and T-RAT	TBL			In favour of TBL	NCG (N = 40)
	Kang et al., 2016	A course of newborn nursing care of 15 weeks	Before and after the course	A checklist for simulation performance evaluation	TBL associated with simulation	Simulation	No significant differences		RCT (N = 74)
	Kim et al., 2016	A course in nursing of 3 weeks	At the end of the course	A13-item clinical performance checklist	TBL	Traditional lectures and case-based discussion		In favour of TBL	RCT (N = 130)
Problem solving ability	Lee, 2018	6 h-course in adult health nursing	Before and after the course	Clinical competences skills instrument	TBL	Traditional lectures		In favour of TBL	NRCT (N = 183)
	Kim et al., 2016	A course in nursing of 3 weeks	At the end of the course	Problem-Solving Scale for Clegge Nursing	TBL	Traditional lectures and case-based discussion		In favour of TBL	RCT (N = 63)
	Lee, 2018	6 h-course in adult health nursing		Problem-solving ability instrument		Traditional lectures			NRCT (N = 183)

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Table 4 (continued)

Learning outcomes	Authors, year of publication	Length of the interventions	Evaluation period	Assessment instruments	Intervention	Comparison	$p > 0.05$ or not stated	$p < 0.05$	Study design and population
Critical thinking ability	Lee, 2018	6 h-course in adult health nursing	Before and after the course	Critical thinking disposition instrument	TBL	Traditional lectures	No significant differences		NRCT (N = 183)
Communication competence	Lee, 2018	6 h-course in adult health nursing	Before and after the course	Global Interpersonal Communication Competence Scale	TBL	Traditional lectures		In favour of TBL	NRCT (N = 183)
Self-Leadership	Lee, 2018	6 h-course in adult health nursing	Before and after the course	The Revised Self-Leadership Questionnaire	TBL	Traditional lectures		In favour of TBL	NRCT (N = 183)
Interprofessional learning ability	Park et al., 2015	A 2-credit health assessment course	Before and after the course	Students' perceived teamwork	TBL			In favour of TBL	NCG (N = 74)
	Wong et al., 2017	A multidisciplinary course	Before and after the course	Readiness for Interprofessional Learning Scale	TBL			In favour of TBL	NCG (N = 40)
Self-directed Learning	Cheng et al., 2014a	4 nursing subjects of the undergraduate course	Before and after each course	Self-Directed Learning Instrument	TBL			In favour of TBL	NCG (N = 387)
	Cheng et al., 2014b	A Maternal-Child Nursing course (18 week) applied for the first time in 2011 and for the second time in 2012	Before and after the course	Self-Directed Learning Instrument	TBL			In favour of TBL	NCG (N = 207)
	Whittaker, 2015	A course that lasted 90 min and with pre-class online lessons	At the end of the course	The amount of time the students spent participating in pre-class online learning activities	TBL	Traditional lectures and work in small groups		In favour of TBL	NRCT (N = 184)
Core nursing competencies (overall outcomes)	Cheng et al., 2014a	4 nursing subjects of the undergraduate course	Before and after each course.	Nursing Eight Core Competencies Scale	TBL	No significant differences			NCG (N = 387)
Classroom engagement	Cheng et al., 2014a	4 nursing subjects of the undergraduate course	Before and after each course.	The Classroom Engagement Survey	TBL			In favour of TBL	NCG (N = 387)
	Cheng et al., 2014b	A Maternal-Child Nursing course (18 weeks) applied for the first time in 2011 and for the second time in 2012	Before and after the course	The Classroom Engagement Survey	TBL			In favour of TBL	NCG (N = 207)
	Mennenga, 2013	A course of 3 credits in community nursing applied for the first time in 2009 and for the second time in 2010	After the course	Classroom Engagement Survey	TBL	Traditional lectures		In favour of TBL	NRCT (N = 143)
Study time	Harmon and Hills, 2015	An undergraduate psychiatric mental health nursing course applied for four years in different cohorts of students	At the end of each course for each cohort of students	Student Self-Report of Time Spent (in hours) in Course Preparation	TBL	Traditional lectures	No significant differences		NRCT (N = 347)
Value of teams	Cheng et al., 2014a	4 nursing subjects of the undergraduate course	Before and after the course	Value of teams instrument	TBL		No significant differences		NCG (N = 387)
	Cheng et al., 2014b	A Maternal-Child Nursing course (18 weeks) applied for the first time in 2011 and for the second time in 2012	Before and after the course	Value of teams instrument	TBL			In favour of TBL	NCG (N = 207)
Learning attitudes	Kang et al., 2016	A course of newborn nursing care of 15 weeks	Before and after the course	Learning Attitude Tool	TBL associated with simulation	Simulation	No significant differences		RCT (N = 74)
	Wong et al., 2017	A multidisciplinary course	Before and after the course	Questionnaire "Attitudes Towards Various Aspects of Team Learning" and	TBL			In favour of TBL	NCG (N = 40)

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Table 4 (continued)

Learning outcomes	Authors, year of publication	Length of the interventions	Evaluation period	Assessment instruments	Intervention	Comparison	$p > 0.05$ or not stated	$p < 0.05$	Study design and population
Accountability	Mennenga, 2013	A course of 3 credits in community nursing applied for the first time in 2009 and for the second time in 2010	After the course	“Perceived Collective Efficacy” Team-Based Learning Student Assessment Instrument	TBL	Traditional teaching methods	Not stated		NRCT (N = 143)
Satisfaction	Mennenga, 2013	A course of 3 credits in community nursing applied for the first time in 2009 and for the second time in 2010	After the course	Team-Based Learning Student Assessment Instrument	TBL	Traditional lectures	Not stated		NRCT (N = 143)
	Raso et al., 2018	A clinical nursing course applied for the first time in October–December 2009 and for the second time in October–December 2010	At the end of the course	A questionnaire used in the pilot phase of the study	TBL	Traditional teaching methods	Not stated		NRCT (N = 425)
Preference compared to traditional lesson	Mennenga, 2013	A course of 3 credits in community nursing applied for the first time in 2009 and for the second time in 2010	At the end of the course	Team-Based Learning Student Assessment Instrument	TBL	Traditional teaching methods	Not stated		NRCT (N = 143)

NGC = quasi-experimental study with no control group; NRCT = quasi-experimental non-randomized controlled study; RCT = randomized controlled trial.

effectiveness of TBL in the long term, and with regard to education in the healthcare field in general the results described in the literature are not encouraging. For instance, in a crossover study aimed at evaluating the effectiveness of TBL compared to traditional lessons in a sample of undergraduate pharmacy students, no significant differences were found in the long term (i.e. six months after the intervention) (Bleske et al., 2018).

TBL has been described as being more effective in developing clinical performance skills compared to traditional teaching methods (Kim et al., 2016; Lee, 2018), but not compared to simulation (Kang et al., 2016).

Interpreting these results in the light of the principles of educational planning, we must consider that traditional lectures are not suited for the development of gestural abilities, but rather for intellectual ones (Zannini, 2015). Practical exercises can have cognitive and gestural characteristics also in TBL, although the findings of a literature review highlighted that conceptual maps and the study of clinical cases were the ones most commonly adopted (Eti, 2016).

4.2. The effectiveness of TBL in developing generic competencies

In relation to the development of competencies, according to the Team-Based Learning conceptual model (Michaelsen and Sweet, 2008; Mennenga and Smyer, 2010) the principal expected competencies are generic competencies (or transferable skills), but there are no reviews in the literature that evaluate this outcome in a population of undergraduate nursing students.

What emerged from the results of the included studies analyzed in the present review is that TBL is effective in developing communication and interprofessional collaboration competencies, as well as self-directed learning (Cheng et al., 2014a; Cheng et al., 2014b; Wong et al., 2017). Moreover, TBL is more effective than traditional lessons (Lee, 2018) even when it is associated with work in groups (Whittaker, 2015).

Divergent results were obtained with regard to the development of problem-solving and critical thinking skills (Lee, 2018; Kim et al., 2016). Cheng et al. (2014a) did not find significant pre-post TBL differences in

the development of core competences in the field of nursing, assessed by using a single validated tool (i.e. the “Nursing Eight Core Competencies Scale”). In the literature, the results obtained on these outcomes are different. In a recent meta-analysis (Lang et al., 2019) aimed at evaluating the effectiveness of TBL in the field of pharmacy, significant results were obtained in favour of TBL compared to traditional lessons with regard to interpersonal and communication competencies, self-directed learning and instrumental competencies linked to critical thinking skills.

The non-significant results obtained by the included studies do not mean that TBL did not have impact on the outcomes mentioned above, because the non-significant results were due to a series of methodological problems, such as poor internal validity, small non-representative samples, or weak statistical analyses. In addition, when interpreting these results, it is important to take into account also the various methodological and conceptual aspects related to complexity of the competencies. In the included studies, competencies were evaluated consistently with what is stated in the conceptual model, but with different scales and tools, and not associated with other evaluation methods, such as observational methods.

4.3. The students' reactions and attitudes following the use of TBL

There is evidence that TBL promotes engagement even if this was not associated with the achievement of the learning outcomes (Cheng et al., 2014a; Cheng et al., 2014b; Mennenga, 2013). Following TBL, students showed high levels of accountability, but no statistically significant data supported this hypothesis. In two studies, students were generally satisfied (Mennenga, 2013; Raso et al., 2018), but not so much as to prefer TBL to traditional lessons (Mennenga, 2013). This could be due to the effect of change, since it was their first experience with TBL, both for the students and the teachers, who were more used to traditional lessons. Moreover, the study sample was very small, and the duration of the intervention was very short. The results regarding these outcomes are divergent also in other studies (Dearnley et al., 2018; Reimschisel et al., 2017; Fatmi et al., 2013).

These are all aspects that need to be taken into account when

evaluating learning outcomes, because – independently from the teaching method – many elements could influence the quality and experience of group learning in students. These outcomes are indicators of process testing, which are more useful in improving the planning of the educational method rather than in determining the effectiveness of the method itself, and therefore its application in a specific context and in a specific population of students.

4.4. Limitations and strengths of the study

The main limitation of this review is the small number of Randomized Controlled Trials and the heterogeneity of the included studies in terms student populations, interventions, and the definitions of the outcomes. A small number of studies could have reached unreliable conclusions. In addition, with regard to the learning outcomes, the included studies investigated different constructs, and are therefore difficult to compare with one another. This problem is exacerbated by the use of terms for which there is no wide consensus. Also the differences in the methodological quality of the included studies entail risks in terms of the validity and reliability of the summarized results. Moreover, in the field of education it is not enough to simply ask ‘*what is effective*’, but you have to ask ‘*what works, for whom, in which circumstances, and in relation to what*’ (Pellegrini and Vivanet, 2018). Adherence to common guidelines for the reporting of TBL educational experiences in academic courses for health professionals (Haidet et al., 2012) addresses this need, facilitating the transfer of research findings into educational practice.

However, this systematic review has two innovative elements: it is the first review focused on nursing education and transferable competencies that includes experimental and quasi-experimental studies; in addition, it answers an educational research question that is in line with the current needs, highlighting gaps in the literature.

5. Conclusion

Through the present review it is possible to state that TBL appears to be effective in achieving the learning outcomes. If we adopt the classification system of the ‘Every Student Succeeds Act’ (ESSA) signed in Shamseer et al., 2015 (Pellegrini and Vivanet, 2018), the studies analyzed in the present review lead to a moderate level of evidence. In addition, not enough evidence is available to prove that TBL is more effective than other teaching methods. The results of the present review provide ideas for thought on two main points: the approach to research (the problem of the method) and the applicability of the results (the problem of transferability). With regard to the first point, we conclude that methodologically sounder studies are needed, which include cultural and subjective evaluations, such as mixed-method studies. In relation to the learning outcomes, there was a lack of uniformity in the way they were defined and measured. Therefore, we recommend future research to focus on defining the learning outcomes of TBL and on disseminating uniform and validated tools for their measurement, especially with regard to generic competencies, so that together these may ensure higher quality reporting according the guidelines already developed. With regard to the applicability of the results, we must consider that evidence-based education does not only involve the effectiveness of research but integrates it with the specific characteristics of the context, the population, and of the teachers’ skills. Therefore, the results of this study could be used to inform decision makers and support the implementation of TBL in nursing education, because this teaching method meets the learning objectives in terms of achieving both subject-specific and generic competencies.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.nedt.2020.104721>.

Funding

This research did not receive any specific grants from funding

agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

This is a review paper. No formal Ethical Committee approval is therefore needed.

Declaration of competing interest

The authors declare that they have no conflict of interests.

Acknowledgement

We would like to thank the librarians of the Brescia University for their valuable help in database search and full text collection.

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