

Team-based and Collaborative Learning Studies in Flipped Classrooms: A Scoping Review in Higher Education

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ABSTRACT

Background: Flipped or reverse class model is a new educational method which created a great revolution in education, significantly higher education, based on new technologies. The flipped class is based on the reliable theoretical foundations and represents a unique combination of learning theories. Team-based and collaborative learning is very inclusive and uses peer evaluation and immediate feedback to ensure individual and team responsibility to promote the learning outcomes. This study aims to provide a scoping of research studies conducted connected to flipped classroom based on team-based and collaborative learning.

Methods: This study used a scoping review method to identify, evaluate, and analyze studies on flipped classrooms based on team-based and participatory learning. The study population is the articles related to flipped classroom, team-based learning, and participative learning in higher education from 2012 to 2022. The articles in this review were selected with criteria including articles with features such as Persian or English publishing language. Then, by quantitative or qualitative approaches, done during the last 10 years. Furthermore, the keywords were flipped classroom, collaborative learning, team learning, team-based learning, and higher education.

Results: The findings show a positive effect of flipped classrooms on team-based and participative learning. The flipped classroom positively affects peer interaction with teachers, enhances collaboration, strengthens team building, and enhances teamwork.

Conclusion: When using a participatory strategy in a flipped classroom, team building, and teamwork strategies could be considered if we look for significant motivational achievements for students. Educators should consider combining the participatory process with active learning methods such as the flipped classroom approach when using the participatory process.

Keywords: Flipped classroom, Collaborative learning, Team learning, Team-based learning, Scoping review, Higher education

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Please cite this paper as:

Ghahramani A, Salimi G,
Mohammadi M, Torkzadeh
J, Heidari E. Team-based
and Collaborative Learning
Studies in Flipped Classrooms:
A Scoping Review in Higher
Education. Interdiscip J
Virtual Learn Med Sci.
2022;13(3):149-164. doi:10.30476/
IJVLM.S.2022.95747.1165.

Received: 4-6-2022

Revised: 25-6-2022

Accepted: 23-7-2022

Introduction

The advent of new educational technologies has somehow provided the transition from traditional education. By covid 19 crisis in early 2020, in many countries, traditional face-to-face training has shifted to online learning platforms (1). The flipped class model is one of the new educational methods which have created a great revolution in education, significantly higher education, based on new technologies. The flipped class is one of the most popular contemporary approaches in the education system. The instructor help learners discover the knowledge by guiding learners and students via discussion and not providing complete solutions (2). One of the developments which may occur in an online flipped classroom and lead to more learning and deep understanding of the material and lead to superficial learning and deep learning is team-based learning. In team-based learning, group members, the class, meetings, and every student in the online flipped class may support one another in fostering a collaborative atmosphere with the greatest amount of contact. High performers in team-based learning do not experience the negative effects of their poor classmates, in contrast to normal group learning. This process holds individuals responsible for their work and individual contribution to their team, and the better the team performs together. Therefore, their team and individual scores are better, and extensive peer training takes place within each team. Team-based learning provides more information about an individual's weaknesses which allows team members and faculty members to assist the individual long before a summative test. Besides, it is not the case that individual performance is reduced, and in this regard, the final score for the learner is derived from individual performance and team performance (3). Flipped class and flipped learning originate from the mission and philosophy of Socrates's teaching (2). Colorado high school teachers Jonathan Bergman and Aaron Sams introduced the flipped class model in 2007 when they began recording slide-based

lectures, presentations, and lectures and releasing them to students who missed most classes (4). In this type of education, the students are required to be actively involved in learning instead of passive recipients of information (5). The flipped class is based on reliable theoretical foundations and represents a unique combination of learning theories once thought to be incompatible (2). Flipped learning refers to structuring the educational process such that students attend face-to-face classes. They already have a theoretical comprehension of a subject that was covered in class. Students feel more at ease and secure asking questions of their teacher and classmates, which increases the effectiveness and productivity of the relationship. The flipped classroom helps solve this problem with learners' unlimited access to the electronic resources (6). Ölmefors & Scheffel considered that flipped classroom design was developed and studied over the past three decades in higher education on a variety of topics. An important factor is the responsibility of learning that the learner implements. While academic studies require student commitment, these individuals are strongly motivated adults because they have primarily chosen their subjects (7). As mentioned, the flipped class has various theoretical foundations, and the most important of these foundations are the blended learning approach as the learner-centered approach (8) and active learning (9). It is used as an online presentation with face-to-face interactions, giving the learner the power to control their learning position and speed. By the movement from the environment in which the instructor is the speaker and performs all educational activities to the environment in which the instructor has the role of supervisor and facilitator. The third theoretical basis of flipped class is active learning (10). Active learning is an approach which focuses on the learner's activity and his mental engagement with the educational content (11). Team-based learning and collaborative learning are among the steps which may occur in an online flipped classroom, leading to more learning

and a deeper understanding of the material and superficial learning. Students may apply conceptual information via activities that incorporate solo work, group collaboration, and quick feedback when they employ the small group learning model known as “team-based learning,” which is a kind of active learning (3). Team-based learning uses participatory learning theory and creates accountability through individual and team evaluation (12). Team-based learning includes elements of direct instruction and active and participatory learning, such as elements related to the flipped classroom. Michaelsen et al, (3) highlighted that team-based learning is usually implemented in three stages: individual preparation, confidence, and application (13). The team-based learning method presented by Larry Michaelsen (1998) improves the quality of students’ learning by increasing problem-solving skills, ensuring the student’s presence in the classroom with prior preparation, and creating an energetic classroom and active learning (14). Team-based learning emphasizes individual and team responsiveness, group interaction, and motivation to participate in group discussions (15). It prepares student-centered learning courses before entering the classroom with the need to do pre-class homework, much like the flipped classroom. involves students in taking part in team and individual exams that reinforce the material from the pre-lecture and aid in learning via regular surveys and teamwork in the classroom (16). Consequently, the students are often engaged in dynamic discussions about key concepts in team-based learning classes. This change in an inclusive classroom improves their understanding of learning objectives and their ability to use concepts beyond the end of the course (17).

Among the factors of team-based learning is the interaction and sharing of concepts and experiences of people in the area under discussion because the presence of a team without the participation and interaction of members will lose its meaning. What highlights the background and logic of the present study is that flipped classroom by

participatory learning in a nursing course shows that flipped classroom can enhance students’ knowledge acquisition, and this can lead to better academic performance. It may be best for nursing educators to adopt the educational strategies to facilitate active learning, such as case-study, collaborative learning, group problem-solving, and inversion classroom discussion. The flipped classroom also improves the lesson experience. (1) TBL combined with flipped learning is an effective teaching method for nursing students’ classes in a psychiatric nursing subject. Nursing students’ perceived facilitators for the class were the teacher as a facilitator, inquiry-based learning, collaboration, and reflection. Non-hierarchical and enjoyable class environments and self-directed learning facilitated class immersion in a psychiatric nursing subject (2). Then, setting up an environment emphasizing collaboration can help students better cope with the challenges flipped learning presents. Although students may change in their comfort level with collaboration, they generally benefit from the enhanced support from collaborative activities, both with their peers and the instructor. Secondly, educators should be well aware of their increasingly important role in the flipped classroom. The essential elements which contribute to a successful flipped learning, such as student engagement, learning autonomy, and efficient use of class time, hinge on the instructor’s meticulous design of activities to provide structural support to the students. Finally, students’ preparedness before the classroom is crucial, so the instructor should pay more attention to the pre-class learning material to ensure student engagement and completion of the tasks. We advise that the quality, length, and content of the video and reading material presented be carefully examined to best suit the students’ needs, and that quizzes be provided after the video or reading material as a feasible way to check and reinforce student understanding (3). By these interpretations and research results, the necessity and logic of the present study can be observed.

The studies of last decade from 2012 to

2022 on flipped classrooms based on team-based learning and collaborative learning will be analyzed. The present study is a scoping review by reviewing related articles published in high-status journals and databases inside and outside Iran, including Scopus, Web of Science, Normagz, Magiran, and SID scientific database during the last decade and By searching for keywords, including, flipped classroom, collaborative learning, team learning, team-based learning. The use of the scoping review research method is because this method can identify, evaluate and analyze studies related to flipped classrooms based on team-based and participatory learning and it can be said that the scoping review feature of this which creates a bigger picture of the subject under study. Scoping reviews can simplify the understanding of a topic and identify common themes across research, or help develop a theory (18, 19). The purpose of this scoping review is to get an overview of the flipped classroom based on team-based learning and collaborative learning that will be organized in the form of the following four questions accepted:

1. How are team-based and participative learning in a flipped classroom defined?
2. What are team-based and participative learning dimensions in the flipped classroom in higher education?
3. What are the methodology and research results of the last ten years of study regarding team-based and participative learning in a flipped classroom?
4. What are the recent ten years of research limitations related to team-based and collaborative learning in a flipped classroom?

Methods

Study Design

The study method used in this research is the scoping review method used to identify,

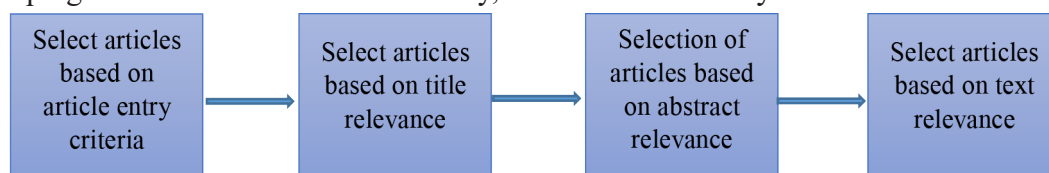


Figure 1: Four steps in selecting articles

evaluate and analyze studies related to the reverse classroom based on team-based and participatory learning. A feature of scoping review is that it creates a larger picture of the subject under investigation. Scoping reviews can simplify the understanding of a topic, and identify common themes across research or help develop a theory (20, 21). The articles in this review were selected with criteria, including articles with features such as Persian or English publishing language. Then with quantitative or qualitative approaches, done during the last 10 years. Furthermore, the keywords were flipped classroom, collaborative learning, team learning, team-based learning, and higher education (Figure 1).

Search Strategies

This study combined their search for related articles published in the scientific journals and databases in Iran and abroad. It examined keywords such as “flipped classroom, invert class, Reverse class, team learning, collaborative learning, team-based learning, and higher education”. Based on the vocabulary, the key was to search the Scopus database, Web of Science, Noormags, Magiran, and SID Scientific Database during the last decade (2012-2022). The researchers of this study searched for articles by combining the mentioned keywords.

Selection Criteria for Articles

The process of choosing the papers for this research was iterative and incremental, separated into a number of phases with distinct stages. The goal of the research activities was to study the most recent findings and trends in team-based, collaborative, and flipped classroom research. 1410 entries were found in the first search. Besides, the present study examines the articles that simultaneously review the titles of flipped

or reverse classrooms and team-based and participatory learning with a quantitative and qualitative approach in English and Persian during the last ten years (from 2012 to 2022). The criteria for including and excluding the articles by a group consisting of two associate professors of educational management, one student of educational management in joint universities of Iran and Germany, and one student in educational management of Shiraz University was determined.

Including Criteria

As shown in Table 1, the inclusion criteria include articles containing features in Persian and English and quantitative or qualitative approaches conducted during the last ten years (until the end of March 2022). The class keywords are flipped or reverse classroom, collaborative learning, team-based learning and team learning, articles published in journals, articles with full and accessible text, and articles with title, abstract, and text related to the title of the present article.

Excluding Criteria

Thus, the criteria to exclude the articles from the scope of the present research following Table 1 include articles whose primary language of publication is non-Persian and English and have non-quantitative and qualitative research approaches. Furthermore, the articles have more than ten years since their publication in various scientific journals. Some articles were published in journals, some articles do not have the full text published in journals, and some articles have titles, abstracts, and text that were unrelated to the present study.

Quality Criteria

This study has thoroughly reviewed articles which have all inclusion criteria and do not meet the exclusion criteria. To decide on entering these articles into the composition stage, a set of characteristics or quality criteria selected as the following:

- Quality metrics focus on describing the concept of the flipped classroom, team-based learning, and collaborative learning.
- Research objectives, research design, research tools, research sample, questions, conclusion, research limitations, and recommendations for future flipped classrooms based on team-based learning and participation in higher education and future research orientations.

By a group, clarity, appropriateness, and relevance were assessed, proposed amendments were implemented, and resolved the problems.

The process of quality criteria was presented in the form of questions with the following code elements:

1. Is the flipped classroom concept, team-centered learning, and collaborative learning clearly defined?
2. Is the objectives of research clearly defined?
3. Is the study have the design to achieve the goals?
4. Is the tools clearly described and based on design?
5. Is the sample and study population clearly described to perform the proposed analyses?
6. Are the research questions adequately answered?
7. Is the conclusion clearly described and based on the results?
8. Do the authors discuss research problems and limitations?

Table 1: The criteria for including and excluding the articles by team working

Excluded	Included
Non-Persian and English languages	Persian and English languages
Non-quantitative and qualitative approach	Quantitative, qualitative, and mixed approach
Over the last ten years	Over the last ten years (end of March 2022)
Not included keywords	Included keywords
Non-refree Journal Articles	Refereed Journal articles
Articles Only Abstract	Full text articles
Title, abstract and content unrelated to the title of the present study	Title, abstract and content related to the title of the present study

9. Is there a suggestion for flipped classrooms, team-based learning, and collaborative learning in higher education?

10. Is the future direction of research presented?

Each question had three options, and the answers were coded as yes (1 point), no (0 points), and partial (0.5 points). Articles in the area of the above questions were scored based on their respective content. Articles in the final process were accepted with 7.5 or higher.

Results

In this section, we will answer the questions of this study by analyzing the selected articles. This structure has been adjusted based on the research questions, and the results of a scoping review will present. The first search

in scientific databases turned up 852 papers with keywords in them. The papers were then chosen after careful examination of the titles, abstracts, and texts, after which inclusion and exclusion criteria and quality standards were used. Fourteen qualified articles based on inclusion and exclusion criteria and approved by considering the conditions of quality criteria were reviewed and analyzed in the final stage (Figure 2).

At this stage, when there are several reviews of the selected articles, researchers, while reviewing each review, reject several articles and do not review them in a scoping review process. It is worth noting that many articles, although with titles. Flipped class and team-based and participatory learning were presented separately, but in terms of content inconsistency and lack of review of

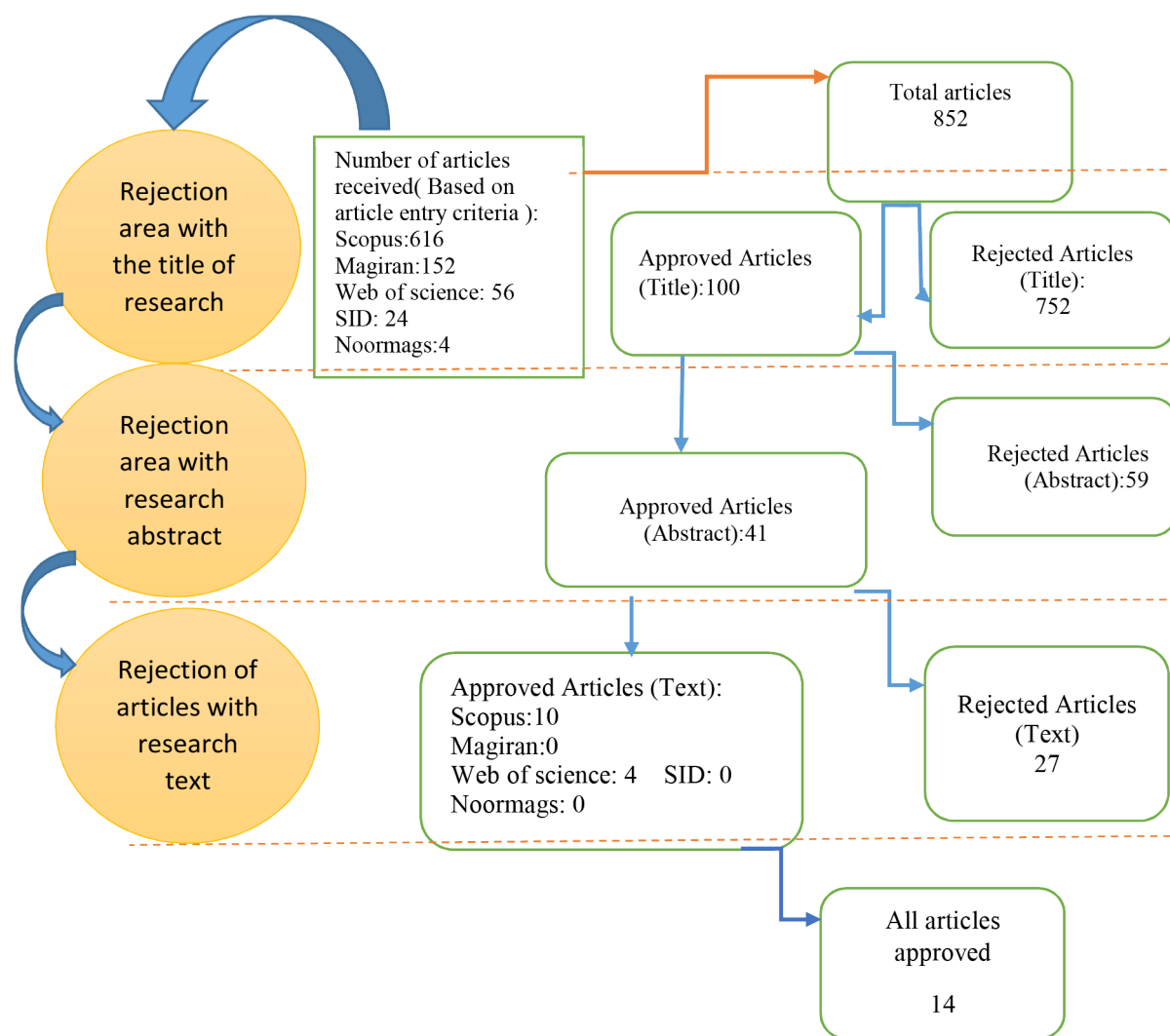


Figure 2: PRISMA of the study

related components, flipped class and team-based and participatory learning indicators were excluded from the review process.

Articles had to be published in Persian or English, use quantitative or qualitative research methods, and include the terms “flipped classroom,” “collaborative learning,” “team learning,” and “team-based learning” in their titles. The articles published in journals related to the present study. In the first phase, 852 articles were obtained. Then, by reviewing the titles of the articles, 752 articles were rejected, and 100 articles were accepted. Formerly, by reviewing the abstracts of articles in this stage, 59 articles were rejected and 41 articles were approved. After reviewing the full content of the selected articles, 27 articles were rejected and 14 articles, including 10 articles from Scopus and 4 articles from Web of Science were finally approved. The results of this scoping review were reviewed and analyzed (Table 2).

Research Questions

How are Team-based and Participative Learning in a Flipped Classroom Defined?

This article will consider the definitions of selected articles from the keywords of flipped classroom, team-based learning, and collaborative learning. To understand and clarify the concept and definition of the flipped classroom, 11 articles (78.57%) of the selected articles defined the flipped classroom, and three articles (21.42%) (Figure 3) provided a clear definition of it. Various concepts are mentioned in the definitions of three words reverse class, team-based learning, and collaborative learning. Active learning, expanding learning responsibilities, talking and engaging with peers, classmates, and instructors, as well as adding more time, are just a few interpretations. Students interact and converse with one another, view instructional films and pre-class teaching-related movies, and work out difficulties in the classroom. As supporters, facilitators, and guides alongside learners, teachers create a relaxed climate, being exposed to educational topics. Pre-class and providing essential knowledge

to students and learners before class, pre-class preparation, and increasing student responsibility. Deeper learning, differentiated education, more efficient use, content sharing, inclusive learner-centered education, lecture delivery, and learning are pre-class alone.

What are team-based and participative learning dimensions in the flipped classroom in higher education?

Among 14 selected articles in the final part of the present scoping review analysis, nine articles have a quantitative approach, three articles have a qualitative approach, and two articles have a quantitative and mixed approach (Figure 4.). Three selected articles from China, one article from Italy, one article from New Zealand, four articles from Taiwan, one article from South Korea, two articles from Turkey, one article from Indonesia, and one article written in Japan. The tools used in nine questionnaire articles, three interview articles, and two articles used both questionnaire and interview tools. In the following, eight articles examined the effects of flipped classroom and collaborative learning, four articles explored flipped classroom and team-based learning, and two flipped classroom articles were examined on collaborative learning and team learning. All 14 selected articles were performed at the university, and the research community related to their research were academic scientific centers. The study population includes selected articles in academic disciplines, including physics, management, technology, statistics, nursing, and dentistry. These studies were conducted in communities with undergraduate and graduate degrees.

What are the methodology and research results of the last ten years of study regarding team-based and participative learning in a flipped classroom?

The purpose of selected articles explored the relationship and impact of the flipped classroom with collaborative learning with 57.14% of the total articles. Furthermore, the focus of the objectives was 28.57% of the selected articles on the relationship and impact of inverse classroom and team-based learning,

Table 2: The review process for selected and final articles

Row	Title	Year	Researchers	Findings and results
1	The effects of flipped classroom characterized by situational and collaborative learning in a community nursing course: A quasi-experimental design	2021	Yujing Dong, Haiyan Yin, Shizheng Du, Aihong Wang	The flipped classroom effectively improved the students' academic performance and promoted the development of higher-level thinking abilities. However, it failed to improve student satisfaction and lesson experience. These findings indicate that active learning strategies, such as situational and participatory learning, problem-solving, and group discussion should be integrated into nursing curriculum which are needed to make students want to improve in the classroom (22).
2	Nursing Students' perception of class immersion facilitators in psychiatric nursing: Team-based learning combined with flipped learning	2021	Hyung-Ran Park, Eunyoung Park	Findings show that team-based learning combined with flipped learning based on constructive learning theory may be a practical educational approach to increase classroom immersion in a psychiatric nursing subject and improve instructor design (23).
3	Flipping a classroom with a three-stage collaborative instructional model (3-CI) for graduate students	2021	Feng-Kuang Chiang, Zhenhua Wu	Joint teacher-student partnerships in the flipped classroom contribute to learners' participation and deeper understanding. Instructors should be aware of their more important role in the flipped classroom to provide structural support to students, including maintaining interaction, creating a social learning environment, and facilitating knowledge building. Instructors should pay attention to lecture videos and readings' quality, length, and content. Tests after watching the video can check and strengthen learners' understanding (24).
4	Student interactions in a flipped classroom-based undergraduate engineering statistics course	2021	Halil Kayaduman	Preliminary findings showed that the flipped classroom approach facilitates students' learning process and increases their interest in the course. Besides, learners found student-content, student-teacher, and student-student interactions. All types of interaction were discussed within the scope of the flipped class approach (25).
5	A creative problem solving-based flipped learning strategy for promoting students' performing creativity, skills and tendencies of creative thinking and collaboration	2021	Lu-Ho Hsia, Yen-Nan Lin, Gwo-Jen Hwang	The results showed that a flipped-based learning approach could significantly increase dance creativity, dance skills, and the tendency of learners to think creatively. Besides, the flipped learning group performed better in dance creativity and dance skills than the team-based learning group. No significant difference was found between the willingness of three groups to cooperate. Finally, learners' feedback reveals that the flipped learning approach helps motivate learners create, increasing their ability to understand dance programs and improving their ability to perform and practice (26).

6	Understanding what determines university students' behavioral engagement in a group-based flipped learning context	2021	Hui-Min Lai	<p>the results showed that</p> <p>(1) The value of interest and the desired value was positively correlated with students' behavioral participation.</p> <p>(2) The positive correlation among students 'value of interest and behavioral involvement was weak in the problematic context of the above-perceived task.</p> <p>(3) There was a negative linear relationship between perceived task difficulty and students' behavioral involvement.</p> <p>(4) Group interaction with peers was positively associated with students' behavioral participation.</p> <p>(5) The positive relationship between desirable value and behavioral involvement of students in terms of interaction with group peers was substantial (27).</p>
7	Flipped learning effect on classroom engagement and outcomes in university information systems class	2022	Meyliana · Bruno Sablan· Surjandy· Achmad Nizar Hidayanto	The results showed that flipped learning increased students' motivation and improved educational outcomes compared to those not exposed to flipped learning. The results can help guide instructors and administrators in the potential implementation of flipped learning in their universities (18).
8	To FLIP or not to FLIP: Comparative case study in higher education in Turkey	2016	Erhan S, engel	The results showed that the performance of homework and the amount of video watching (preparatory work before class (flipped) were significantly more effective for student progress in the flipped classroom. Besides, although students initially struggled to adapt to the new system, students who know and feel responsible for their learning can bridge the gap with more individual and group activities and score higher (19).
9	Comparison between flipped classroom and teambased learning in fixed prosthodontic education	2017	KeisukeNishigawa, KatsuhiroOmoto ,RikaHayama,KazuoOkura, ToyokoTajima, YoshitakaSuzuki, MakiHosoki, ShujiShigemoto, MayuUeda, Omar Mariano ManingoRodis, YoshizoMatsuka	The final exams showed that the TBL classes scored slightly higher than the flipped classrooms. Reference test results showed higher scores for the same curriculum, and no significant interaction was found between class format and end-of-semester and reference test scores. The analysis did not show any significant differences in the effectiveness of the class templates. Our previous study reported that TBL was more efficient than traditional style speech. There was no statistical difference in test scores between the returning classroom and TBL in the present study. Therefore, we conclude that both styles are very effective compared to traditional ones. They constitute credible lectures and formats for clinical dental education (28).

10	Flipping business education: Transformative use of team-based learning in human resource management classrooms	2017	Chung-Kai Huang and Chun-Yu Lin	The study results show positive relationships between valuable contributions, motivation, pleasure, and student learning outcomes. Research findings and implications provide ideas, insights, and insights on using team-based learning modules in flipped classes to business educators, researchers, and decision-makers (29).
11	A pilot study examining the impact of collaborative mind mapping strategy in a flipped classroom: learning achievement, self-efficacy, motivation, and students' acceptance	2020	Xudong Zheng·Tristan E. Johnson · Chunhong Zhou	The results showed that participatory mind mapping strategy and flipped classroom significantly improve students' learning progress and self-efficacy. Additionally, compared to students who participated in solitary mind mapping, students in the inverted classroom showed a more favourable attitude on embracing and using participatory mind mapping. These concepts provided instruction for educational designers to apply participatory mind mapping in a flipped classroom and suggested that designers focus on improving student motivation by integrating other strategies (30).
12	A reflective thinking-promoting approach to enhancing graduate students' flipped learning engagement, participation behaviors, reflective thinking and project learning outcomes	2019	Mei-Rong Alice Chen, Gwo-Jen Hwang, Yu-Ying Chang	The results showed that the proposed approach increased the results of students' learning design and reflective thinking project and increased their participation in pre-reverse learning class (31).
13	Impact of the flipped classroom model and collaborative learning in childhood teaching university degree	2017	Ana Ortiz Colon, Inés Muñoz Galiano, María Colmenero-Ruiz	The study results based on the designed tools show the progress in using the participatory learning in both groups, which is especially valuable in the flipped classroom group. Concerning implementing the teachers' model, the coaches' amount of work and effort highlighted, and the increase in the learners' competence in the average grade obtained is emphasized (32).
14	Student perspectives of independent and collaborative learning in a flipped foundational engineering course	2019	FOX, Wendy H.; DOCHERTY, Paul David	This study showed that students enjoy independent learning and appreciate the increased collaboration resulting from the flipped approach. Students were able to identify learning styles that fit them because to this approach's flexibility, which allowed for a broad variety of approaches to autonomous study and cooperation. This study concludes with practice tips to further support independent and participatory learning using flipped approaches (33).

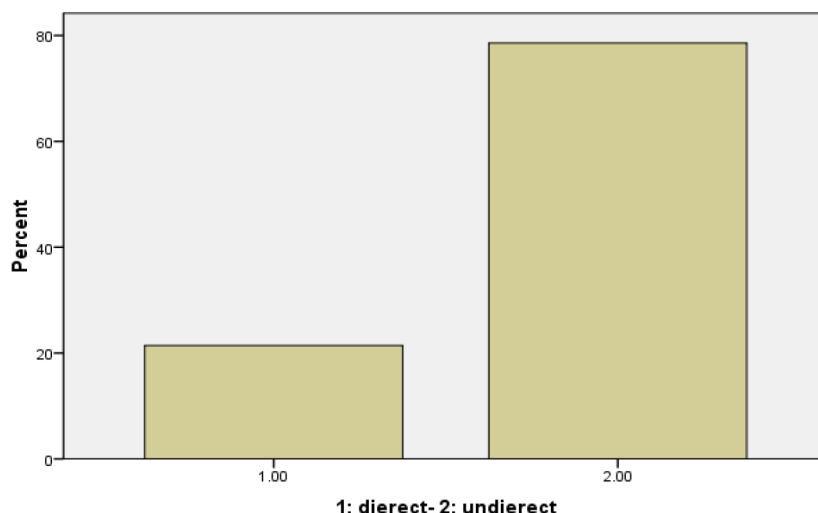


Figure 3: Percentage of direct and indirect flipped classroom definitions of selected articles

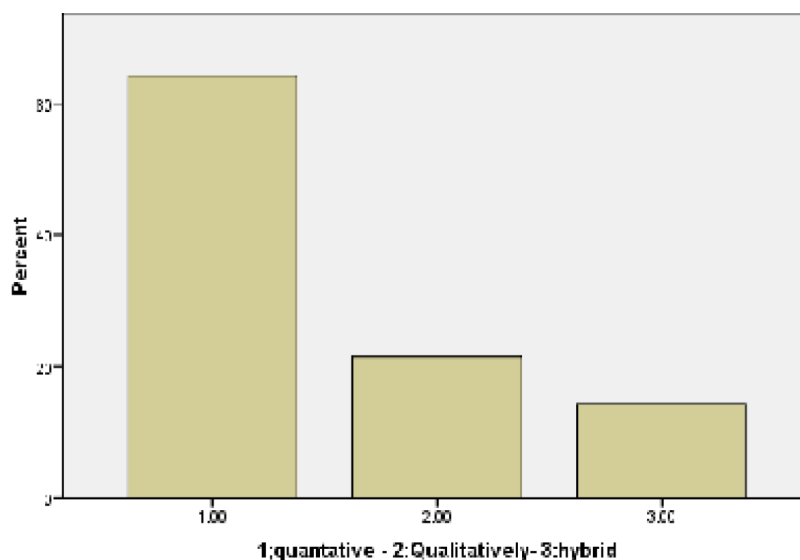


Figure 4: Percentage and number of quantitative-qualitative- mixed method of selected articles

and some selected articles (14.28%) focused on the relationship and impact of inverse classroom team-based learning and collaborative learning. The findings indicated that 42.85% of the selected articles were from the quasi-experimental research method. 28.57% of them were from the qualitative research method, and 7.14% of the articles were from the mixed research method (quantitative and qualitative). Finally, 7.14 of the quasi-experimental research method and 14.28% of the articles used the experimental method to conduct their study.

Similarly, the findings of the selected articles indicated that in the field of flipped classrooms and participatory learning, some

studies resulted in the formation of a flipped classroom with participatory learning in a specific training course. Those studies showed that flipped classroom collaborative learning could enhance student achievement which lead to better academic performance and the development of critical thinking, self-awareness, and evaluation. This perception is in line with the findings of some articles (22). Teacher-learner partnerships in the flipped classroom contribute to learners' participation and deeper understanding. Educators need to be aware of their more important role in the flipped classroom in providing structural support to learners, including maintaining interaction, creating a

social learning environment, and facilitating knowledge building. Instructors should pay attention to lecture videos' quality, length, content, and reading material. After watching the video (reverse classroom preliminaries), the exams can test and reinforce learners' understanding. The results and findings of some selected articles confirm this (24). These results also suggest that team-based learning using the flipped classroom offers a number of benefits. In the beginning, the teacher promoted collaborative learning, self-directed learning, reflection, and immersion in entertaining classrooms with a non-hierarchical atmosphere. Learners actively integrated different ideas through working with team members and immersed themselves in the classroom. They were able to become more immersed in the classroom through the process of critical thinking and instant feedback. Therefore, although students initially struggled to adapt to the new system, students who know and feel responsible for their learning can narrow the gap further through individual and group activities such as team learning. They can achieve higher grades, which is the effect of the flipped classroom on team-based learning (19).

What are the limitations of recent ten years research related to team-based learning and collaborative learning in a flipped classroom?

Findings indicated that nine articles out of the total number of selected articles had considered generalizability as a variable, and this is in terms of using space and different environments used in the study. One of the articles mentioned the possibility of generalizability in similar groups. Four articles have considered the possibility of mental bias, such as students' perception. Two articles have stated the limited implementation of different factors at the class level, such as different factors at the class level. Some articles have other limitations, such as richness and depth. Using a valid scale, data guiding learners to learn collaboratively and team-oriented at the flipped classroom level, lack of necessary data on the amount and manner of pre-class learning, time, reviewing

feedback, increasing study duration, and data collection, such as email.

Discussion

This study was conducted in a flipped classroom based on team-based and participative learning with a scoping review research method. The data of this research were collected from 852 articles that were collected from reputable scientific databases. The flipped classroom strategy helps pupils learn and sparks their interest in the subject. Additionally, students discovered that engaging in learning relationships with other students, content, and teachers was beneficial. Based on the findings, all types of interaction, participative learning, and their relationship with each other are implemented within the scope of the reverse classroom approach (25). Asking and solving questions to create more interactive feedback and participatory learning can stimulate students to think (26) the group interaction with peers positively correlated with students' behavioral involvement. Besides, group interaction with peers moderated the nonlinear relationship between perceived task difficulty and students' behavioral engagement (positive effect of participatory learning). When group interaction with peers was high (participatory learning), task difficulty was perceived. Finally, students' behavioral participation was moderate (high positive effect of the flipped classroom on participatory learning) (27). Flipped classroom students had a more positive attitude toward acceptance and use of participatory mind mapping than students did in individual mind mapping (the effect of a flipped classroom on team-based and participatory learning) (30). Progress in participatory learning is also evident, especially in the reverse classroom group (32). Flipped classroom teaching and team-based learning styles are more effective than the traditional lecture style and form a valid teaching format as the reverse classroom affects team-based learning (28). Positive relationships are among valuable contributions, motivation, enjoyment, and

student learning outcomes. Research findings and implications provide ideas, and insights on using team-based learning modules in flipped classrooms to business educators, researchers, and decision-makers on the impact of reverse classroom learning on team-based learning (29). Finally, flipped learning increased students' motivation and improved educational outcomes compared to the group not exposed to flipped learning. Students appreciate the increased collaboration resulting from the reverse approach. The flexibility of this approach enabled a wide range of approaches to independent learning and collaboration, and students were able to find learning styles that suited them. This article concludes with practice tips to further support independent and participatory learning using flipped approaches (18, 33).

Furthermore, the findings of this research can be discussed in the axes of definitions, purpose, research method, results, and limitations as follows:

By examining the definitions and descriptions of the term participatory learning, concepts of learners' responsibility, conceptualizing knowledge, learners' participation, peer understanding, discussion, interaction and cooperation of peers with and with educators, active learning, interactive guidance, sharing content, content learning, self-efficacy, participatory knowledge building, participatory problem solving, increasing learning motivation, learning progress, description of ideas, active interaction and reinforcement of learning were observed.

Using flipped classroom and the interaction and cooperation of students with each other and with professors and with the curriculum, the participation of classmates in the content and activities of group and team, and partnership emphasize the flipped classroom atmosphere and their findings show that from pre-class time to active learning which is one of the features of team-based learning and collaborative learning, can be effective, and in fact, the role of flipped classroom participation in team-based learning and

collaborative learning and Observes a group and evaluates it positively.

Despite using three major research approaches (quantitative, qualitative, and mixed) in the trend of articles presented during the last 10 years (end of March 2022) regarding flipped classrooms and team-based and collaborative learning, using experimental research approach is much more and less. The approach used is a hybrid approach.

The flipped classroom approach facilitates students' learning process and increases their interest in the course. In addition, students found student-content, student-teacher, and student-student (participatory learning) interactions. Based on the findings, all types of interaction (participatory learning) and their relationship with each other are implemented within the scope of the flipped classroom approach.

Training courses in different environments (different training environments) may have different results and this generalizability will be variable. The amount and manner of content learned in the flipped classroom before the face-to-face class can not be specifically monitored, reinforced, and evaluated. Furthermore, the number of people participating in a flipped class and the arrangement and manner of sitting of learners (row and row or roundtable) for collaborative learning and team-based learning is considered a challenge in holding a flipped classroom. Because deep understanding in the classroom is a mental process (possibility of mental bias), it seems difficult to quantify. The findings of some articles led to students' perceptions rather than their performance, which was a major challenge and again resulted in the possibility of conceivable mental bias. The need to utilize appropriate scales was cited as one of the restrictions. At the flipped classroom level for collaborative and team-based learning, guiding students on how to engage and cooperate was a necessary and constraint. Regarding the presence of different effective factors at the level of a class, it is not possible to implement these factors at the flipped classroom level widely (the need

for further studies). The richness and depth of the data are underestimated in some cases, and more team activities can be performed at the level of a flipped classroom, which is currently not possible in terms of various constraints and factors, as well as how to conduct research. The issue of adequate time is one of the key issues at the level of a flipped classroom for collaborative and team-based learning and the occurrence of learning. Examining feedback is a fundamental point.

Conclusion

The findings of selected articles indicated the flipped classroom's positive effect on team-based and collaborative learning. These results were obtained using quantitative research approaches and qualitative and mixed research. Furthermore, the interpretation of the objectives and results of research shows that the flipped classroom has a positive effect on peer interaction, increases collaboration and partnership, strengthens team building, and increases teamwork. The factors mentioned in collaborative learning and team-based learning strengthen and increase flipped classroom feedback. Participatory strategies should be considered to improve and enhance students' knowledge in the flipped classroom. When using a participatory strategy in a reverse classroom environment, team building and teamwork strategies should be considered if we look for significant motivational achievements for students. Educators should consider combining the participatory process with active learning methods, such as the flipped classroom approach when using the participatory process.

Limitations and Suggestions for Future Studies

This study has several limitations. The present scoping review uses validated relevant studies to describe the flipped classroom situation based on team-based and collaborative learning. It can be said to be a description of the included research. Five databases were used to search and follow the articles related to the title of the present

research. A specific time (last ten years - from 2012 to 2022) is mentioned, and there may be other related articles in years outside the mentioned range that have not been used. Besides, the articles used in this scoping review are articles in English and Farsi only. There may be articles related to the present title with a language not used. According to the principles and results achieved, several suggestions are considered as follows:

- Because the number of articles which were implemented with a quantitative approach in the field of the flipped classroom, team-based learning, and collaborative learning in higher education centers during the last ten years is more than qualitative and mixed approaches. Future studies could use more qualitative approaches.
- The results indicated that flipped classrooms' relationship and impact with participatory learning are more than the relationship and impact of the flipped classroom on team-based learning.
- Future research focuses on the impact of flipped classrooms on team-based learning.

Conflict of Interest: None declared.

Acknowledgments

Acknowledgments from Ms. Laleh Raisi, a joint student of Shiraz University and the University of Dresden, Germany.

Ethical Considerations

This article is taken from a doctoral dissertation on educational administration. The ethics committee of Shiraz University approved the present study.

Funding/Support

This study did not receive any funding.

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