

Effectiveness of the Flipped Classroom Strategy in Learning Outcomes (Bibliometric Study)

Thuraya Sulaiman Al-Shabibi
Sultan Qaboos University
Muscat, Oman

Mohammed Abdul-Karim Al-Ayasra
Sultan Qaboos University
Muscat, Oman

Abstract. The aim of this study is to explore the effectiveness according to the flipped classroom strategy in learning outcomes. To achieve this, the descriptive method of "bibliometric analysis" was used. It analyzed (233) scientific studies and evaluated them in a critical manner in light of the study questions, within the range of eight years (2012-2019) in order to identify the variables that these studies sought to investigate on the strategy, its impact on those variables, and the justification behind its positive impact. The study results reveal that the flipped classroom can provide students with a more interactive environment that will lead to higher learning achievement and better preparation for 21st century learning and work environments. Many of the studies targeted by the present study have analyzed the advantages and privileges of this strategy and the importance of its application in different stages of education because of its obvious results in improving the range of learning outcomes. In view of its findings, the study recommended an expansion of teachers' use of the flipped classroom strategy because of its positive impact in learning outcomes. It also suggested conducting studies on the reasons behind the lack of a clear positive impact of the strategy in some studies.

Keywords: strategy; flipped classroom; survey; bibliometric study.

Introduction

The rapid development of communication and information technologies and the spread of digital literacy among school and university students have led to the emergence of new teaching and learning systems. These technologies have resulted in innovative teaching strategies based on diverse technology tools, notably the Flipped Classroom strategy. Flipped Classroom is a form of

integrated education that intelligently employs modern technology to provide education that meets the learner's needs in the 21st century. In this strategy the student becomes a researcher by his own when using technology effectively through learning outside the school boundaries, promoting critical thinking, self-learning, communication skills and collaborative work among students, which, all, make difference in the students' educational outcomes (Adhuwaykh, 2013).

Those interested in the teaching methods and strategies considered the flipped learning as the future of education. They perceive it as the easiest way to apply technology in education, without prejudice to the principles of traditional education that consider direct interaction, between the teacher and the learner on the one hand and the learners on the other, an essential foundation for building learning (Zohi, 2014).

Bishop and Verleger (2013, p.2) defined the flipped classroom strategy as: "An educational strategy that employs asynchronous learning by watching recorded videos for lectures and lessons, which motivate the learner to watch them as homework before coming to class. The lesson time is allocated to actively participate in problem-solving techniques collectively." This definition indicates that the flipped classroom strategy contains two types of learning activities: individualized learning outside the classroom time by watching recorded videos and collective interactive learning among learners during the lesson.

Azahrani (2015) points out that this strategy is based on flipping the learning process. Instead of receiving new concepts in the classroom and then doing homework at home, the learner receives new concepts in the flipped classroom at home by watching videos that are prepared by the teacher and that last from 5 to 10 minutes. The teacher shares these videos with the students on a Web2 site or on social networking media. They can also share video clips, multimedia, or educational games from online resources such as YouTube for Education, Khan Academy, Or TED Talk and other educational sites.

Asherman (2015) shows that when the learner follows-up the explanation of the educational material through modern technology- such as tablets or smart phones- he is able to: proceed at his own pace, pause the explanation of the material whenever he wishes to write down notes or questions about the content and then continue to display the explanation again, re-watch more than once in order to understand the material displayed, the learner can also go backward and forward to clarify certain points, or transcend a section already known. Thus, the strategy takes into account individual differences between learners, and increases their enjoyment of learning.

Adhuwaykh (2013) confirms that the role of teacher and learner is different in this strategy. The teacher is here to guide, assist and motivate. He supervises the progress of activities, tasks and projects, and provides support to learners who need more attention. As a result, the teacher can spend more time interacting with learners, and go deeper in effective and appropriate educational activities.

In this strategy, the learner becomes an active researcher and user of technology by learning outside the classroom, fostering critical thinking, self-learning, experience building, social communication skills and collaboration to achieve 21st-century skills in education. This strategy is distinguished from other strategies and educational methods by many advantages that take into account the learner's overall needs and capabilities to achieve better learning. Thus, the flipped classroom strategy has received considerable attention in many advanced countries.

The two researchers noted the scarcity of bibliometric studies that aimed at analyzing previous studies carried out on the flipped classroom strategy. The researchers found only four bibliometric studies conducted on this strategy, including: Lundin et al. (2018) study which investigated the previous studies conducted on the flipped classroom strategy in the database (Scopus database) including (530) studies, published in the period from (2011 - 2015). The researchers analyzed the previous studies in terms of: 1-educational stages, 2-academic disciplines suitable for the implementation of the strategy, 3- the countries that implemented the strategy, 4- methods of data collection and 5- the needed recommendation and future research. The study found that the number of studies implemented in this strategy is growing rapidly over time, reflecting the increasing interest in the strategy. Most of these studies focused on implementing the strategy in higher education, specifically in the fields of science, technology, engineering and mathematics, and most of them were conducted in the United States. Further studies are needed to improve the practices of the strategy implementation.

The study of Zainuddin and Halili (2016) aimed at analyzing 20 previous studies carried out in the flipped classroom during the period from (2013-2015). Content analysis was used to examine methodologies, field of study, technology tools used, references cited, influences on students' learning, and challenges of the flipped classroom strategy. Descriptive analysis used frequencies and percentages. The study found that previous studies used some technology to implement the strategy as online platform. Impact analysis showed that the flipped classroom had positive impacts in students' learning such as achievement, motivation, participation, and interaction. There is a need to address some of the challenges in applying the flipped classroom by future researchers, such as the adequacy of the flipped classroom due to the poor quality of the visual lectures and the untrained teacher.

Bormann (2014) conducted an analytical study to explore the effectiveness of the flipped classroom strategy in students' participation and achievement as well as the advantages of the flipped classroom model compared to the traditional model by analyzing (19) scientific studies on the flipped classroom and assessed them critically. He targeted the scientific studies available on EBSCO and Google Scholar databases, from (2012-2014). The study concluded that this strategy was well received by students and teachers at different academic levels. The study also revealed that flipped classroom strategy has more benefits and advantages compared to its shortcomings; it also provides an interactive environment for learners and focuses on higher levels of thinking. In addition,

students were comfortable with this strategy, and their access to information gave them more confidence to learn outside the classroom.

Bishop and Verleger (2013) conducted an analytical study on the previous studies on flipped classroom strategy. They analyzed (24) scientific studies until 2012 in terms of its objectives, methodology, tools used, target groups, activities used within and outside the lesson, and findings. The researchers concluded that most of these studies focused on the perceptions of learners about the strategy. The study also emphasized the importance of employing the flipped classroom strategy in teaching, especially in stimulating learning, and enhancing teamwork and collaborative learning values.

It is worth noting that these bibliometric studies dealt with the evaluation of the Flipped Classroom strategy in general and did not elaborate, in details, its impact on the different aspects of the learning process and the learning outcomes. This is, in specific, the focus of this study, in addition to highlighting the reasons behind the positive impact of the strategy on learning outcomes. This is what other previous bibliometric studies lack and this study came to fill.

Study Problem

Analyzing dissertations and scientific studies is important to discuss the impact of the flipped classroom strategy in various variables addressed. The researchers noticed the lack of bibliometric studies that focus on the impact of this strategy in each of the learning outcomes. Most of them did not elaborate on the positive impact of the Flipped Classroom strategy on the various educational outcome, so this study aims to fill the gap in this field by focusing on discussing the impact of the flipped classroom strategy in the variables addressed.

Study Objective:

The current study aims at reviewing the previous studies that address the flipped classroom strategy so as to investigate the effectiveness of this strategy in learning outcomes and identify the reasons for its impact in these outcomes.

Study Questions:

The study seeks to answer the following questions:

- 1- What is the distribution of the previous studies that addressed the flipped classroom strategy according to (year of publish, approach and samples nature, countries that conducted these studies, subjects, research tools used, statistical variables)?
- 2- According to the previous studies, what is the impact of using the flipped classroom strategy depending on the different variables addressed by these studies?
- 3- How did the previous studies explain the impact of the flipped classroom strategy in learning outcomes?

Study Importance:

This study provides a comprehensive and in-depth overview of the results of implementing the flipped classroom strategy in the educational learning process.

The studies have shown positive results on students' performance after implementing this strategy. However, the overall view through a larger set of studies within a decade and at different study levels provides researchers and practitioners in the educational process with better indicators of the effectiveness of this educational strategy. Discussing the impact of this strategy and its effectiveness may allow teachers and supervisors to determine the usefulness of implementing this strategy in the classroom, as well as how to implement it correctly.

Study Limits:

- Data Base Limit: The study covered educational research publications published in the subject of the Flipped Classroom, through the databases available in the libraries of the University of Sultan Qaboos (ProQuest Dissertations & Theses Global, Edu Search, Scopus database, Almanhal and Shamaa) And the studies published in scientific journals and conferences, issued in Arabic and English, amounting to (233) studies.
- Time Limit: The study covered the educational research published in the period (2012), the date of the first published study obtained by the researchers, to (2019).
- Subject Limit: The study included all disciplines and courses.

Study Approach:

The study used the bibliometric descriptive analytical method. The two researchers sought to analyze the scientific studies that addressed the flipped classroom strategy. They monitored their results according to the given variables that were included and identified their impact on those variables and the justification for the positive impact of the strategy.

Study Sample:

The study population consisted of a group of studies that dealt with the strategy of the Flipped Classroom, published in Arabic and English until 2019, through the databases available in the libraries of the University of Sultan Qaboos (ProQuest Dissertations & Theses Global, Edu Search, Scopus database, Almanhal and Shamaa) They included Ph. D. and Master thesis, a number of studies published in scientific journals and conferences , which has reached approximately (7650) study. In view of the large size of the study population, the researchers aimed at randomly selecting the sample, which consisted of (233) scientific studies

Study Instrument:

In this study, an analysis card was used to analyze the content of the studies that were reached. It contains the following:

- Define all the variables of the previous studies and research under study.
- Give one frequency to each variable (noting that one study contains a variable or more).
- Determine the outcome of the study for each variable.

- Define the justifications for the positive impact of the strategy in the various variables.

To verify the instrument validity, it was presented to three arbitrators professors in the curricula and teaching at Sultan Qaboos University and took their comments and suggestions thereon. The instrument reliability was verified by piloting the instrument to (6) studies outside the study sample and comparing results with the results of one of the specialized researchers on the same sample. The percentage of agreement was 94%.

Study Results and Discussion

To answer the first question: "What is the distribution of the previous studies that addressed the flipped classroom strategy according to (year of publish, approach and samples nature, countries that conducted these studies, subjects, research tools used, variables?)", the researchers used the analysis card to analyze, assess and classify the previous studies that addressed the flipped classroom strategy. The analysis card included: Author's name, year, country, study objective, study approach, subjects, study tools and findings. The following charts and tables illustrate the distribution of studies according to: the year, study approach, samples, countries in which studies were carried out; subjects; research tools used; and study variables. Table (1) shows the frequency and percentages of the distribution of studies according to the year.

Table 1. The frequency and percentages of the distribution of studies according to the year

years	frequency	percentage
2019	4	2%
2018	48	21%
2017	51	22%
2016	53	23%
2015	43	18%
2014	21	9%
2013	10	4%
2012	3	1%
total	233	100%

Table (1) shows the recent studies that addressed the flipped classroom strategy, where the researchers found that these studies started in 2012 and that the number of these studies has increased over the years, culminating in the studies

analyzed in 2016. Table (2) shows the frequency and percentages of the distribution of studies according to the study approach.

Table 2. The frequency and percentages of the distribution of studies according to the study approach

Methodology	frequency	percentage
experimental	207	89%
descriptive	24	10%
mixed	2	1%
Total	233	100%

Table (2) shows that most studies (89%) have used the experimental approach which is appropriate for the nature of the strategy and the variables addressed by these studies.

Table (3) shows the frequency and percentages of the distribution of studies according to the nature of the samples.

Table 3. The frequency and percentages of the distribution of studies according to the nature of the samples

The Sample	frequency	percentage
Students	205	84%
Teachers	28	11%
University faculty	7	3%
Studies and research	4	2%
Total	244	100%

Table (3) shows the diversity of samples targeted by previous studies to provide a comprehensive overview of the strategy. Some studies have used more than one type of sampling, and most of them have targeted students of different educational stages. Table (4) illustrates distribution of studies according to the grades.

Table 4. The frequency and percentages of the distribution of studies according to the grades

Class	frequency	percentage
Undergraduate	100	42%
Twelfth grade	23	10%
11th grade	19	8%
Tenth grade	25	11%
Ninth grade	17	7%
Eighth grade	18	8%
Seventh grade	11	5%
Sixth grade	12	5%
fifth grade	7	3%
fourth grade	6	3%
Total	238	100%

Table (4) shows that previous studies targeted students at different educational stages, from grade 4 to university level. Most of these studies focused on the university level, which means that the strategy can be applied at different educational levels. Table (5) shows the frequency of distribution of studies according to the countries.

Table 5. The frequency of distribution of studies according to the countries

Country	frequency	percentage	Country	frequency	percentage
USA	75	32.2%	Japan	2	0.9%
Saudi	61	26.2%	Emirates	1	0.4%
Egypt	40	17.2%	Bahrain	1	0.4%
Jordan	13	5.6%	Iraq	1	0.4%
Palestine	6	2.6%	Yemen	1	0.4%
Oman	4	1.7%	Iran	1	0.4%
Australia	4	1.7%	Korea	1	0.4%
Turkey	4	1.7%	Brazil	1	0.4%
Qatar	3	1.3%	Taiwan	1	0.4%
Kuwait	2	0.9%	Sweden	1	0.4%
China	2	0.9%	Canada	1	0.4%
Britain	2	0.9%	Malaysia	1	0.4%

Indonesia	2	0.9%	Total	233	100
Germany	2	0.9%			

Table (5) shows the interest of a big number of countries in the flipped classroom strategy, However, the higher number of studies on this topic came from U.S.A, where this strategy originated - and then in Saudi Arabia and Egypt.

Table (6) presents the subjects (courses) targeted by previous studies.

Table 6. The frequency and percentages of the distribution of studies according to the specializations (courses)

A course	frequency	percentage
Mathematics	50	23%
Sciences	36	17%
Educational Technology	33	15%
English Language	18	8%
Arabic Language	14	6%
Social Studies	12	6%
Teaching Methods	11	5%
Various courses	11	5%
Medicine	9	4%
Islamic Education	6	3%
engineering	5	2%
Home Economics	3	1%
Physical Education	3	1%
special breeding	3	1%
Measurement and evaluation	2	1%
Business	1	0%
Kindergarten	1	0%
Total	218	100%

Table (6) shows that this strategy has been applied more in applied science courses such as mathematics and science, in addition to technology of education. It has also been applied in human sciences courses. This means that this strategy can be applied to different subjects.

Table (7) contains the study instruments used in previous studies.

Table 7. The frequency and percentages of the distribution of studies according to the instruments

Tools	frequency	percentage
exam	140	36%
observation	50	13%
Questionnaire	49	13%
Measure of perceptions and trends	40	10%
Interview	38	10%
Thinking tests	28	7%
Motivational scale	15	4%
Self-efficacy scale	10	3%
Skills tests	9	2%
Self-learning scale	6	2%
Content Analysis	4	1%
Measure habits of mind	3	1%
Total	392	100%

Table (7) shows that previous studies have used various research tools, and that a large number of studies have used more than one data collection instrument. Tests were among the most commonly used instruments, followed by observation and survey. As for the variables targeted by previous studies, Table (8) presents the frequency and percentages of the distribution of studies according to study variables.

Table 8. The frequency and percentages of the distribution of studies according to study variables

Variables	frequency	percentage
achievement	141	36%
Evaluation of strategy	53	13%
Trend towards strategy	30	8%
thinking skills	29	7%
Classroom participation	27	7%
Electronic Skills	22	6%
Motivation	18	5%
Trend towards the course	15	4%
Self-efficacy	14	4%
Self-learning	12	3%
reading and writing	9	2%
Teaching skills	7	2%
Keep learning	5	1%
Performance skills	5	1%
Reduce anxiety	4	1%
Habits of mind	3	1%
Total	394	100%

Table (8) shows the frequency and percentages of the distribution of studies according to the study variables. It shows that the previous studies targeted the impact of the flipped classroom strategy focusing on various variables, and the researchers believe that it is one of the most important learning outcomes that the educational process seeks to develop among students. It is also clear from results that academic achievement is one of the most important variables targeted by previous studies.

To answer the second question: "According to the previous studies, what is the impact of using the flipped classroom strategy depending on the different variables addressed by these studies?", the researchers analyzed the previous

studies and assessed them using the analysis card according to the impact of the strategy in the different variables addressed by these studies. Figure (1) shows the distribution of variables according to the impact of the strategy included.

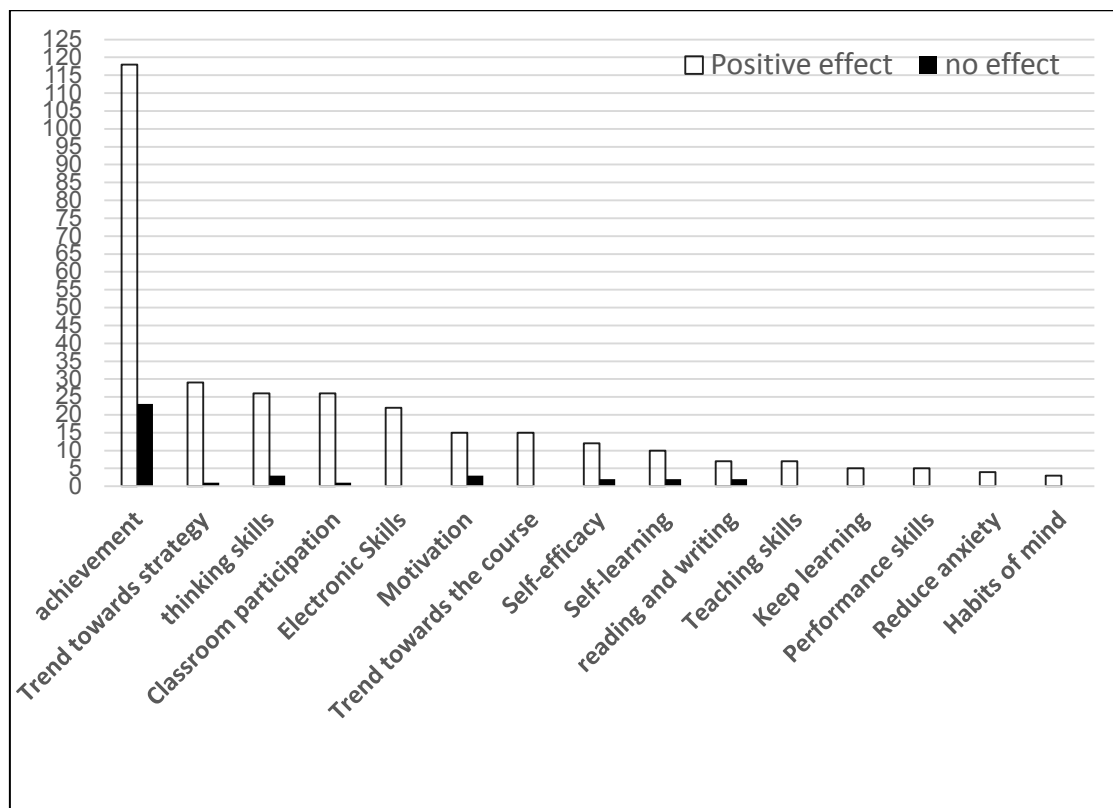


Figure 1. The distribution of variables according to the impact of the strategy

Figure (1) shows the distribution of studies according to the variables, and the impact of the strategy. The empty column indicates the positive impact of the strategy, while the black column indicates that there is no impact of the strategy. It is noted that the flipped classroom strategy has a clear positive impact in most of the variables targeted by the previous studies.

To answer the third question: " How did previous studies explain the impact of the flipped classroom strategy in learning outcomes?", the researchers analyzed the previous studies to justify the positive impact of the strategy on various variables. They found that previous studies attributed the positive impact of the strategy to the following reasons:

Students performing a number of tasks and individual activities prior to attending the lesson, including watching educational videos, writing questions they would like to give to the teacher or their classmates, which helps them spend more time for prior learning and prepare well for the lessons. Therefore, the original time of the lesson gets richer and full of discussion. The lesson time will be used for higher thinking skills to solve problems related to the subject, and debate more effectively compared to the traditional methods.

When students watch videos before the lesson, it will enable them to prepare questions for the teacher and their colleagues in the classroom. These questions help them understand and check their comprehension. In this regard, Brame (2013) stated that reading the material prior to the lesson prepares students mentally and intellectually for the activities and applications that take place during the lesson, and that evolve around what the students have learned at home. Bergman and Sams (2014, p. 146) have emphasized, after applying this strategy, that it made it possible to make students come to the classroom with comments and questions about the subject, making them ask better questions over time and thinking more deeply about the learnt content. It also became easier to follow students individually and see if they have any misunderstandings of concepts and correct them.

Watching videos prior to the lesson helps students to feel comfortable and confident. It helps them also to overcome the fear that some students may experience as a result of traditional teaching situations and consequently making them feel unable to perform the tasks assigned to them (Shurair, 2017, p. 95). In the flipped classroom students are encouraged to watch educational videos before class and outside the classroom at their own pace and time, according to their own learning path. Whether the student is quick or needs more time to absorb the content, he can watch the video more than once, and speed up to reach desired pace (Al-Kahili, 2015, p. 48).

Watching these educational videos through mobile devices or computers has made it possible for students to be more involved in the educational process. In addition, linking the educational materials to the internet and social networking media (WhatsApp, Facebook) responds to students' needs and interests in the current time. Regular archiving of videos helps students learn, practice, and go back to videos when needed and during preparing for exams.

As the feedback provided by the teacher to his students is the main material for learning according to the flipped classroom strategy (Sherman, 2015, p. 224), it is expected that providing feedback to the students - on a continuous and direct basis, individually and collectively, during classroom activities, quizzes and classroom assignments - has had a significant impact in this aspect following this strategy.

When students are introduced to new experiences and concepts using a new strategy that is stimulating them mentality and encouraging them to participate in discussion and interact with activities, it affects positively on students. They become more active, enjoy doing activities and love what they learn. The strategy also facilitates the learning process and enhances students' self-concept and confidence.

Because the flipped classroom strategy is based on other concepts and methods such as active learning, in which the student is at the center of the learning process, it became prominent how important is the student's role. The learner is perceived as an active learner, participant and collaborator, who actively

participates in the activities and tasks assigned to him. On the other hand, the teacher's role in active learning is to direct, guide, facilitate and manage the learning process towards achieving the desired goals (Hamdallah, 2016, p. 51). This strategy focuses on Bloom's taxonomy, where students work on lower cognitive levels (remember, and understanding) before the lesson during watching the educational video. On the other hand, students focus on the higher cognitive levels (application, analysis, and assessment) in the lesson, during the implementation of classroom activities and exercises, and during the activation of active learning strategies, where the students receive support from their teacher and peers (Eid, 2017, p. 311).

Using the flipped classroom strategy helps to optimize the teacher's time during and outside the classroom (Johnson & Walvoord, 1998, 30). The lesson is transformed into a training workshop through interactive activities, work papers, and group work that the teacher applies. In these activities and worksheets, the teacher answers students' questions, discusses with them, confirms their true information and corrects the wrong ones, and provides appropriate support to those who have not reached the required level. This strategy provides the teacher with more time to interact with students, use higher thinking levels to solve problems related to the subject, and discuss with them effectively during the lesson rather than lecturing in class and listening to the explanation. Thus, allowing students to understand the lesson more deeply. Furthermore, the lesson time will be allocated to further enrichment, discussion, communication, cooperation, consultation and constructive dialogue under the teacher direction and guidance. This is in line with Bergman and Sams (2012, p. 93) suggesting that the flipped classroom environment increases the lesson time, where the teacher is able to implement a large number of educational tasks.

The flipped classroom strategy plays a major role in minimizing the gap between the theoretical study of science and knowledge and its practical aspect in real life (Ashami, 2018, p. 53). It helps to link theoretical study with practical application, by examining the theoretical and cognitive content prior to the lesson through watching videos. Furthermore, it emphasizes the application aspect during the lesson through individual and group activities, and active learning strategies, which may play a role in emphasizing the knowledge acquired by students.

This strategy uses video technology for optimal use; it is effective and positive for its features and benefits. This technology is thrilling, facilitates following-up and focuses student's attention, with the ability to quickly introduce the lesson to the students making them motivated to watch the educational content on screen. At the same time, it combines audio, image, and motion. The senses of sight and hearing participate in the reception of the cognitive content, which helps to increase students' focus on concepts, receive the cognitive content, and continue to follow the lesson to its end, as indicated by Ibrahim (2017, p. 458). Providing the learning content to students outside the classroom and making it available online throughout the semester enables them to see and understand all the lessons, even if some students were not able to attend one of the classes for any reason (Hawas, 2015, p. 273).

This strategy also contributes to the maintenance of the learning process even after the end of the study time, through practicing after-class activities, which aims to help students reach the proficiency level (Abdel Barr, 2017, p. 45).

In addition, this strategy takes into consideration the individual differences among students. Each student learns according to his own ability and speed, away from the usual educational situation. During the lesson, the teacher helps the students who have not reached the required level. The rest of the students are given additional training and enrichment activities (AL-Kurd, 2017, p. 16).

Conclusion and recommendations

The study aimed at revealing the impact of the flipped classroom strategy in learning outcomes through reviewing previous studies. The study showed that the previous studies targeted the impact of the flipped classroom strategy in many variables. The researchers believe that it is one of the most important learning outcomes that the educational process seeks to develop among students. The study concluded that the flipped classroom strategy has a positive impact in most of the variables targeted by previous studies, including: academic achievement, attitudes, classroom participation, thinking skills development, motivation for learning, self-learning, and anxiety reduction. Therefore, the study recommends expanding the use of the flipped classroom strategy by teachers because of its positive impact in promoting various aspects of the educational process. The study also suggests conducting other studies on assessing the effectiveness of the flipped classroom strategy from the point of view of teachers, learners and parents, and the reasons behind the lack of a clear positive impact of the strategy in some studies.

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An appendix

The studies included in the analysis

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