

TEACHING SCIENCE USING FLIPPED LEARNING TO SUPPORT STUDENTS IN INCLUSION CLASSES AND ITS IMPACT ON ACHIEVEMENT AND SELF-EFFICACY

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Abstract

The study aimed to investigate the effectiveness of teaching science using flipped learning to support students in inclusion classes and its impact on achievement and self-efficacy. An assessment of self-efficacy in the scientific field was created using the experimental technique with a quasi-experimental design. The sample in this study included (100) students; (50) students from Abu Bakr Al-Siddiq school in Jordan and (50) fifth-grade students from Medina in Saudi Arabia. Each school had two groups, the first was an experimental group consisting of (25) students, and the second was a control group consisting of (25) students. The study's findings indicated favorable outcomes for the experimental group in the post-achievement exam for the two samples. The results showed that the post-self-efficacy test results for the two samples showed statistically significant differences, favoring the experimental group. The results revealed no variations between the two samples from the two schools.

Keywords: Science, Flipped Learning, Achievement, Self-Efficacy.

1. INTRODUCTION

Flipped learning is an important novel technical solution to treat the shortcomings of conventional education methods and develop the degree of interaction and thinking skills among students. Flipped learning is a teaching method that uses technology to make learning better in school. It helps teachers talk and interact with students more, instead of just giving lectures and traditional teaching. In the flipped learning method, the learners watch short recorded presentations of lectures anywhere they wish, which allows additional time to discuss the content in class under the supervision of the teacher (Al-Sayeh, 2020). Achievement in science is a concept commonly used in the field of education because of its importance in determining and evaluating performance. It is also considered an important criterion by which the quality and quality of education can be judged. Several studies have confirmed that employing modern teaching strategies and activities that link e-learning and teaching in the classroom is an important and necessary requirement to improve the level of achievement among learners (Al-Sayed & Hussein, 2023).

Flipped learning is also linked to improving self-efficacy, as it helps the learner improve his performance in the required tasks, encourages him to develop his thinking to solve difficult situations and problems, and find appropriate solutions. It also helps to develop cognitive, linguistic, and social skills through the performed activities. Self-efficacy is a

mediating factor for behaviour modification, and an indicator of the individual's expectations about his ability to overcome various tasks, successfully perform them, and realistically plan for them, represented by his awareness of the extent of his capabilities, which motivates him to perform a certain behavior acceptably, in addition to increasing his ability to endure. It is also It may positively or negatively affect patterns of behavior and thinking (Al-Shabibia & Al-Ayasra, 2020).

1.1. Problem statement

Diversity in the use of teaching methods has become a necessary and urgent matter in the current period, and the use of technological tools in the educational sphere has become a basic requirement for improving the educational process. The use of flipped learning is considered one of the modern trends in teaching to ensure the development of teaching methods to suit students in the modern era, away from traditional methods. It is important in the learning and teaching process, which leads to improving students' achievement and increasing their desire to learn through the use of modern learning strategies in teaching science.

The flipped learning strategy also allows students to exert more effort to complete the educational tasks assigned to them, which achieves excellence by increasing their efficiency in solving the problems they face in a way that suits their different abilities and skills.

1.2. Questions of the study

The main question of this study was: "What is the effectiveness of teaching science using flipped learning to support student learning in inclusion classes and its impact on achievement and self-efficacy?"

The following sub-questions emerge from this question:

1. Are there any significant variations in the scores of the fifth-grade students in Jordan and Saudi Arabia in the pre-academic achievement test?
2. Are there significant variations in the scores of the fifth-grade students in Jordan and Saudi Arabia in the pre-self-efficacy test?
3. Are there significant variations in the scores of the fifth-grade students in Jordan and Saudi Arabia in the post-academic achievement test?
4. Are there significant variations in the scores of the fifth-grade students in Jordan and Saudi Arabia in the post-developing self-efficacy test?
5. Are there significant variations in the scores of the fifth-grade students in Jordan and Saudi Arabia in the post-developing self-efficacy test due to the school variable?

1.3. Objectives of the study

The main objective of this study was "to identify the effectiveness of teaching science using flipped learning to support student learning in inclusion classes and its impact on achievement and self-efficacy."

The following sub-objectives were formulated.

1. To identify the presence of apparent variations in the scores of the two groups in the pre-academic achievement test.
2. To identify the presence of apparent variations in the scores of the two groups for the pre-self-efficacy test.
3. To identify the presence of apparent variations in the scores of the two groups in the post-academic achievement test.
4. To identify the presence of apparent variations in the scores of the two in the post-developing self-efficacy test.
5. To identify the presence of statistically significant differences in the scores of the experimental group members for the post-self-efficacy test due to the school variable.

1.4. Significance of the study

This study highlights modern education strategies that target the principle of individualizing education, and providing students with the opportunity for controlled, self-learning based on modern technology. This study contributes to providing a learning environment that increases learners' positivity in teaching-learning situations, which leads to increased academic achievement and self-efficacy. The results might help learners and teachers by clarifying the mechanism of applying the flipped learning strategy to develop the teaching of science for different age stages. The study also provides a set of recommendations and proposals that encourage scholars and researchers to conduct future studies and research. The results of the study contribute to those working in the educational field to adopt modern strategies that consider individual differences among students, as a positive step in increasing the effectiveness of educational outcomes.

1.5. Limitations of the study

- The study was limited to the fifth-grade students in Jordan at Abu Bakr Al-Siddiq School for Boys and Saudi Arabia at Medina Primary School. The study was conducted during the second semester of the year 2022/2023. The study was conducted at Abu Bakr Al-Siddiq Primary School in Amman and Medina Primary School in Riyadh.

2. LITERATURE REVIEW

2.1. Flipped learning

Flipped learning is an important modern trend to overcome the problems of traditional learning by effectively integrating technology into the educational process. The flipped learning strategy is based on the opposite of what happens within the traditional classroom environment by transferring the initial learning process outside the classroom while allocating class time to carry out more learning activities and develop the mental and cognitive skills of all students (Ismail, 2015).

Al-Masry (2022, p. 42) defined flipped learning as “a teaching method that relies on preparing lessons in the form of presentations accompanied by educational films and presented to students through the WhatsApp platform or CDs to be watched at home, remembered, and answered some questions before coming to school. Then students go to school to carry out investigative activities, educational tasks, exercises, and exercises prepared by the teacher. The teacher then reviews and follows up on the students’ answers to determine who answered correctly and directs them to help their peers who did not answer the questions and implement the activities.” Al-Talhi (2019, p. 12) defined flipped learning as “a strategy in which learning is flipped by watching short video clips at home, and class time is invested in discussion, dialogue, and solving performance activities and tasks.”

Al-Shammari (2019, p. 71) defined it as “a strategy that works to reshape the educational process so that the traditional role played by the school and the home changes so that each takes the place of the other. This is why the flipped classroom strategy was given this name.” On the other hand, Al-Ghamdi (2018, p. 1377) defined it as “an educational method through which students are exposed to new knowledge outside the classroom by watching recorded educational lessons, after which the students are exposed to dialogue, discussion, and problem-solving in the classroom.” Bayoumi (2016, p. 16) defined it as “an educational strategy in which several modern trends in learning are practiced: self-learning, blended learning, active learning, and direct learning.”

Several studies and literature have indicated that flipped learning has many pedagogical benefits and educational advantages. Flipped learning follows modern technologies and the digital age and meets the needs of the current generation, as it allows the learner to use a smartphone, participate in activities with colleagues, and communicate and interact at the same time (Al-Masry, 2022). It is characterized by flexibility, as it contributes to providing educational content via the Internet so that the learner can view it anywhere and at any time. The speed of learning is manageable by flipped learning because it is suitable for all high-achieving and low-level students and those with learning difficulties, as they can watch the video based on their speed of comprehension regardless of the differences between the students’ levels. It motivates students to use modern technology optimally during the educational process (Mustafa, 2019).

Using flipped learning invests class time to implement activities and discussions, as flipped learning allows students to learn the lesson at home. In addition, it creates a strong relationship between students and the teacher, as it provides ways for interaction and communication between students and the teacher, developing higher-order thinking skills and enhancing their comprehension abilities (Ahmed, 2018). It also provides a mechanism to evaluate student learning, whether it is assignments or tests taken by students, which are considered a good indicator of the strengths and weaknesses in their learning of educational content, which helps the teacher focus on it and provide immediate feedback to students during class time. Moreover, it encourages students to engage in collaborative learning, self-learning, and motivation to use technology in the learning process, in addition to helping the teacher make great use of the class for motivation and guidance (Al-Masry, 2022).

Al-Kahili (2015) identified the steps for implementing a flipped learning strategy in six steps. Firstly, the teacher must identify the lesson in which he wants to flip the class and implement the strategy. Secondly, the teacher must analyze the educational content into important knowledge, skills, and concepts that students must know. Thirdly, educational videos must be made that contain scientific material in pictures and audio and for a duration ranging from 5-10 minutes. Fourthly, the teacher directs students to watch educational videos either via the Internet or CDs, outside or inside, at any time and place. Fifthly, students need to employ the concepts learned from educational videos during the class through projects and active learning methods. Finally, the evaluation step in which the process of students learning inside the classroom is assessed using appropriate evaluation tools.

2.2. Self-efficacy

Self-efficacy is a component of effective and good learning, which expresses the learner's ability to accomplish the tasks required of him and judge what can be accomplished. It measures his flexibility and perseverance in dealing with difficult educational situations and overcoming situations of failure that he faces. Self-efficacy focuses on using the skills that the learner possesses and employing each skill associated with appropriate situations. It represents the learner's faith and belief in his ability to solve the problem in the future.

Asem (2021, p. 321) defined it as "the individual's knowledge of his self-expectations and his ability to overcome tasks, which is represented in self-convictions and the ability to control requirements and overcome the difficult problems he faces in the academic environment." Al-Sayed et al. (2020, p. 572) also indicated that it is "the experience and knowledge skills an individual possesses about a subject, which support the individual's self-confidence and continuity in working successfully so that the individual can determine his abilities and aptitudes in advance, and determine his ability to complete the required work successfully." Barqiq (2020, p. 27) defined it as "the feeling of an individual's ability to produce and organize events in his life, which helps to understand the growth of the individual's skills. It focuses on the individual's producing the largest amount of the finest quality in the shortest time, with the least effort, and with a great deal of satisfaction and satisfaction." Moreover, Salman (2020, p. 7) defined it as "a person's perceptions of his ability to organize and carry out the actions necessary to obtain the specified performance of the skill to carry out tasks and goals." Al-Budairi (2017, p. 24) defined it as "the individual's belief and confidence about his capabilities and information and the extent to which he can achieve a good level in academic tasks by exerting the required effort."

Debby (2018) indicated that self-efficacy can be classified into several types. Firstly, general self-efficacy refers to the ability to behave in ways that achieve desired and positive results at a specific time, control life pressures that affect individuals' behavior, and issue self-expectations when performing several activities and tasks, and the activity, effort, and perseverance necessary to achieve work. to be accomplished. Secondly, special self-efficacy refers to an individual's judgments that are related to his ability to perform certain tasks in a specific activity, such as geometric shapes and mathematics, or in the Arabic language, such as expression and parsing. Thirdly, academic self-efficacy

refers to a person's knowledge of his potential and abilities to perform educational duties to desired levels, and it is affected by a group of variables: the degree of academic readiness and the age of the students.

2.3. Previous studies

Al-Qarni (2023) determined how the flipped classroom technique affected the degree of success in the English language course. The study used a quasi-experimental design on a sample of 30 people, which was split into two groups: the experimental group, which had 15 female students, and the control group, which also had 15 female students. The results of the study showed that the experimental group's female students outperformed the control group's female pupils on the test.

Abdel Malak (2023) explored how blended learning strategy develops self-efficacy and social responsibility for students in the scientific divisions of the College of Education. The research sample included one group, and the experimental and descriptive methods were used on a sample of (25) students, chosen randomly. The effectiveness of the blended learning strategy in teaching the scientific culture course to develop self-efficacy and social responsibility for students of the science divisions at the College of Education was clear from the results.

Tahmazi and Al-Daami (2023) studied how the flipped classroom method impacted how well girls did in social studies. 60 female students were separated into two smaller groups and studied using an experimental methodology. There were 30 female students in the first group, also known as the experimental group. 30 female students comprised the second group, also known as the control group. The results demonstrated that the flipped classroom approach improved the social studies performance of female pupils.

Al-Morsi (2022) investigated the effects of regular and interactive films used in flipped learning on the academic performance of second-year secondary school students taking computer courses. They also looked at how pupils felt about this form of instruction. 60 pupils from the Badr Secondary School in Riyadh were chosen for the study. The post-test results revealed that the experimental group outperformed the control group, and this difference was statistically significant. In other words, the experimental group outperformed the control group in terms of performance. The average scores of the groups that used the new teaching strategy and those that didn't showed a clear distinction. On the exam on using regular and interactive videos for flipped learning, the first group performed better.

Al-Salti and Sahrir (2021) found out how the flipped classroom strategy affects the confidence of twelfth-grade students studying math in Oman. The researchers used a type of experiment that was not fully controlled. They had a group of 52 students, both boys and girls. The students were split into two groups. One group learned in the usual way, while the other group learned in a different way called the flipped classroom method. The findings indicated that the flipped classroom strategy has an impact on belief in oneself.

Al-Shabibiyah and Al-Ayasrah (2020) looked into how employing a flipped classroom may help students feel more confident and less anxious before exams. The study used a sample of two groups, the first being an experimental group with (66) female students and the second being a control group with (63) female students, and it used the quasi-experimental approach to both. According to the study's findings, the experimental group's scores after the therapy were noticeably different from those of the control group. After the test anxiety scale was administered, the average scores of the experimental group were greater than those of the control group. The research also showed that people tend to have less exam anxiety when they are more assured of their skills.

Al-Otaibi (2020) studied how using the flipped learning strategy affects student performance and their ability to remember what they learn. This study was conducted with students taking an academic skills course at Shaqra University in Saudi Arabia. The study used a specific research method called quasi-experimental. The group of students used in the study was made up of 50 individuals, and they were separated into two different groups. The results of the study showed that the experimental group's pupils outperformed the control group on the academic achievement exam. The average scores of the pupils in the experimental group and the control group were noticeably different.

According to Yousef (2020), teaching Islamic education through visualization is beneficial in fostering students' sense of spiritual intelligence and self-efficacy. The study used a semi-experimental methodology, and the sample size was 63 students, who were split into two groups: an experimental group with 34 participants and a control group with 29 participants. The study's findings demonstrated the value of using imagination as a strategy to increase students' academic self-efficacy and spiritual intelligence in all of its dimensions. They also revealed a relationship between students' levels of spiritual intelligence and their academic self-efficacy test results.

3. METHODOLOGY

This study employed an experimental technique using a quasi-experimental design, which is congruent with the goals of the study, which were to examine the efficacy of teaching science using self-regulated learning in terms of academic accomplishment and the development of self-management skills. It was based on two groups: an experimental group that underwent self-regulated learning and a control group that underwent standard research methods.

3.1. Sampling

Students in the fifth grade from Medina Primary School in Riyadh and Abu Bakr Al-Siddiq School in Amman made up the study population. (100) students made up the study sample, and (50) were chosen from each school. Then, there were two groups at each school: the experimental group, which included 25 pupils, and the control group, which included 25 students with special needs.

Table 1: Distribution of study sample members

Sample	Group	Frequency	Percentage%
Abu Bakr Al-Siddiq	Experimental	25	%25
	Control	25	%25
Medina Primary School	Experimental	25	%25
	Control	25	%25
	Total	50	%100

3.2. Instrument of the study

To accomplish the goals of the study and respond to its inquiries, two instruments were constructed. A quick introduction to these instruments is provided below.

First: the achievement test

The study developed an achievement exam to assess the academic achievement of themes taught to pupils in the fifth grade of primary school in both groups to respond to the study's questions and accomplish its goals. The test covered the sixth unit of the science subject for the third semester, which is the unit (Forces and Energy), and the test consists of (50) questions.

To check the validity of the test, it was presented in its initial form to a group of judges specialized in science teaching and methods and a group of science teachers and mentors, and based on their opinions and suggestions, the test was modified. Using the (SPSS) application, the test reliability parameters were determined using Cronbach's alpha reliability coefficient. The test has a good level of reliability, as seen by the Cronbach's alpha coefficient of (0.807).

Second: Self-efficacy scale

A group of theoretical literature and previous studies that dealt with self-efficacy were reviewed, and thus the scale consisted of (10) items measuring self-efficacy. The scale was designed on a four-point Likert scale, and each item was answered with the options (never, rarely, often, always).

The validity was checked by presenting the scale to a group of judges specialized in science curricula and methods, and a group of faculty members in Saudi universities, and based on their opinions and suggestions, very minor modifications were made, until the scale came out in its final form. The scale's reliability parameters were calculated using Cronbach's alpha reliability coefficient through the use of the (SPSS) program, and Cronbach's alpha coefficient in the scale was (0.867).

3.3. Data analysis

To conduct statistical analysis after experimenting in the current study, the data was processed using the Statistical Package for the Social Sciences program, where mean scores, standard deviations, and the independent Samples T-test were used to compare the means of two independent groups.

4. RESULTS AND DISCUSSION

4.1. Findings of Question One

The differences in the average scores of the experimental and control groups for the achievement test on the pre-scale were assessed using the mean scores, standard deviations, and a T-test for two separate samples. The findings are shown in the table below.

Table 2: Results of the variations in the mean achievement test scores between the experimental and control groups on the pre-test

Academic achievement test in science	School	Group	No.	Mean score	Standard deviation	T value	Sig.
	Abu Bakr Al-Siddiq	Experimental	25	12.64	2.27	1.200	.236
		Control	25	11.96	1.69		
	Medina Primary School	Experimental	25	11.88	1.786	1.079	.286
		Control	25	11.40	1.32		

The results provided in the above table reveal that the t value was (1.200) for the answers of the students of Abu Bakr Al-Siddiq Basic School, and it is not significant at the level of significance ($\alpha \leq 0.05$), where the level of significance reached (.236), and this shows the equality of the two groups before experimenting.

The table also shows that the t value was (1.079) for the answers of the students of Medina Primary School, and it is not significant at the level of significance ($\alpha \leq 0.05$), where the level of significance reached (.286), and this shows the equality of the two groups before experimenting.

4.2. Results of Question Two

As indicated in the accompanying table, the differences between the average scores of the experimental and control groups for the achievement test were ascertained using the mean scores, standard deviations, and a T-test for two independent samples.

Table 3: Results of the average scores of the experimental and control groups for self-efficacy on the pre-test

Variable	School	Group	Mean score	Standard deviation	T value	Sig.
self-efficacy	Abu Bakr Al-Siddiq	Experimental	11.24	1.45	.322	.749
		Control	11.12	1.16		
	Medina Primary School	Experimental	11.28	1.33	1.071	.289
		Control	10.88	1.30		

As shown in Table 3, the t value for the answers of the students of Abu Bakr Al-Siddiq Basic School was (.322), and it is not significant at the level of significance ($\alpha \leq 0.05$), where the level of significance reached (.236), and this shows the equality of the two groups before experimenting.

The t value for the answers of the students of Medina Primary School was (1.071), and it is not significant at the level of significance ($\alpha \leq 0.05$), where the level of significance reached (.289), and this shows the equality of the two groups before experimenting.

4.3. Results of the third question

Table 4: Results of the differences between the average scores of the experimental and control groups for the achievement test on the post-test

Academic achievement test in science	School	Group	No.	Mean score	Standard deviation	T value	Sig.
	Abu Bakr Al-Siddiq	Experimental	25	23.92	2.13	21.909	.000
		Control	25	11.96	1.69		
	Medina Primary School	Experimental	25	24.76	1.96	28.211	.000
		Control	25	11.40	1.32		

The table clearly shows that there are differences between the experimental and control groups following the accomplishment test, with the experimental group benefiting. This demonstrates that flipped learning affects raising fifth-grade students' success levels at Abu Bakr Al-Siddiq Basic School.

After administering the achievement exam, the Table demonstrates statistically significant differences between the experimental and control groups at the level of significance (0.05), favoring the experimental group. This confirms that flipped learning has an impact on improving the achievement of fifth-grade students in Medina Primary School. These results are consistent with previous studies (Al-Qarni, 2023; Tahmazi & Al-Daami, 2023; Al-Morsi, 2022; Al-Otaibi, 2020).

4.4. Results of the fourth question

Table 5: Results of differences between the average scores of the experimental and control groups for self-efficacy on the post-test

Variable	School	Group	Mean score	Standard deviation	T value	Sig.
self-efficacy	Abu Bakr Al-Siddiq	Experimental	25.16	1.65	34.740	.000
		Control	11.12	1.16		
	Medina Primary School	Experimental	24.24	2.49	31.031	.000
		Control	10.88	1.30		

The table makes it evident that there are variations between the experimental and control groups that appear to favor the experimental group about self-efficacy on the post-scale. This demonstrates that flipped learning at Abu Bakr Al-Siddiq Basic School affects raising pupils' levels of self-efficacy. For self-efficacy on the post-scale, there are statistically significant differences between the experimental and control groups at the level of significance (0.05), favoring the experimental group.

This demonstrates that fifth-grade pupils at Medina Primary School benefit from flipped learning by having higher levels of self-efficacy. These results agree with (Abdul Malak, 2023; Al-Salti & Al-Ayasra, 2020; Al-Shabibiyah & Al-Ayasra, 2020; Yousef, 2020).

4.5. Results of the fifth question

Table 6: Results of the variations between the average scores of the experimental group for the achievement test and the self-efficacy scale on the post-test based on the school variable

Variable	School	Group	Mean score	Standard deviation	T value	Sig.
Academic achievement test in science	Abu Bakr Al-Siddiq	Experimental	23.92	2.13	1.446	.155
	Medina Primary School	Experimental	24.76	1.96		
self-efficacy	Abu Bakr Al-Siddiq	Experimental	25.16	1.65	1.671	.101
	Medina Primary School	Experimental	24.24	2.20		

The table clearly shows that there are no statistically significant differences between the experimental group for the accomplishment test on the post-scale attributable to the school variable at the level of significance (0.05). Due to the school variable, there are no statistically significant differences between the experimental group and control group for self-efficacy on the post-measure (0.05).

5. RECOMMENDATIONS

The study recommends the need to pay attention to teaching science to students through teaching methods that provide students with enjoyment, learning, and self-reliance, and the most important of these methods is flipped education. It is recommended to hold training courses for science teachers to train them on modern teaching methods and strategies in general and flipped learning in particular. Teachers should develop students' thinking skills by paying attention to activities and questions that stimulate thinking and create an attractive learning environment for students to allow them the freedom to express their different ideas and opinions without shame or fear. The study also recommends science teachers use the flipped learning strategy in teaching because it has an impact on achieving the desired goals and increasing student achievement. There is a need to improve the methods and ways of presenting the electronic content of the science curriculum to enhance students' ability to understand and comprehend, in a way that is commensurate with the student's level and their ability to deal with the materials presented.

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