

Enhancing the Students' Academic Motivation and Learning Achievement through the Flipped Classroom Approach: An Educational Intervention

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ABSTRACT

Background: Academic motivation is a fundamental aspect of learning that provides intensity and direction to a learner's behavior. In recent years, the flipped classroom teaching method has gained popularity as a pedagogical approach that aims to enhance student learning outcomes and engagement. This study aimed to compare the efficacy of flipped Classroom Approach on elementary school students' academic motivation and learning achievement.

Methods: An educational interventional study employing a pretest-posttest design was conducted with an intervention and a control group. The study enrolled sixty eligible students who were studying in two elementary schools from August to December 2021. They were randomly allocated to intervention (flipped classroom approach, n=30) and control (traditional method, n=30) groups. To measure academic motivation, we used the standardized questionnaire, the Harter Academic Motivation, which consists of 33 questions. Also, for measuring the learning achievement, we developed a 20-item multiple-choice questionnaire. Data were analyzed using IBM SPSS v 22.0. Multivariate analysis of covariance (MANCOVA) was performed. P-value<0.05 was considered as the significance level.

Results: The mean learning achievement and academic motivation scores in the intervention groups increased more than that the control group significantly (P<0.001). In contrast, in the control group, no significant changes were observed (P>0.05). Additionally, the outcomes demonstrated a significant increase in academic motivation scores among the flipped classroom group, particularly in the areas of preference for challenging academic tasks, focus on students' curiosity, tendency towards independent mastery, and preference for easy work subscales, compared to the control group (P<0.001). The study did not find significant improvements in other areas of extrinsic motivation, such as satisfaction with the instructor or achieving grades, and reliance on the teacher's evaluation.

Conclusion: According to the results, flipped classroom approach can improve the students' learning achievement and academic motivation regarding science.

Keywords: Distance, Learning achievement, Flipped classroom, Academic motivation, Elementary school students

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Introduction

Educational strategies are influential factors in learning levels and academic motivation (1). In recent years, the flipped classroom teaching method has gained popularity as a pedagogical approach that aims to enhance the student learning outcomes and engagement (2). The flipped classroom approach involves providing students with instructional materials, such as videos or readings, to review out the class time, and then using class time for interactive and collaborative learning activities facilitated by the teacher (3).

Therefore, students can learn at their own pace and in a way that is tailored to their individual needs (4). This approach also promotes greater collaboration among students as they work together to solve problems and share their knowledge. With the teacher acting as the designer and manager of classroom activities, the flipped classroom creates a flexible learning space that is independent of time and place. In addition, by adopting this innovative teaching method, students are not only able to achieve better academic results, but they also develop a greater sense of motivation and engagement in their learning (5, 6).

Academic motivation is a fundamental aspect of learning that provides intensity and direction to a learner's behavior (7). It plays a crucial role in helping the learners maintain their interest and continue their learning journey (8). With this motivation, individuals are inspired to take the necessary steps to successfully complete a task, achieve their goals, or attain a certain level of competence in their work. Ultimately, this leads to success in their learning and academic progress (9).

Several studies have investigated the impact of the flipped classroom on students, including its impact on learning outcomes (10), creativity (11), various learning outcomes (12), academic progress (13), academic motivation (14), student satisfaction, and retention of knowledge. Research has shown the effectiveness of the flipped classroom as a teaching technique for enhancing learning

achievement and academic motivation in students. Nonetheless, in contrast to the findings from certain other research studies, no notable distinction was observed between traditional and flipped classrooms (15, 16). In addition, the majority of the studies mentioned above have concentrated on examining the effects of the flipped approach on particular aspects of the learning process. Further research on the effectiveness of teaching using the flipped classroom can shed light on the importance of using this method in the education process. With this in mind, we aimed to determine whether teaching based on the flipped classroom is effective in improving the learning achievement and academic motivation of elementary school students in Shiraz, Iran.

Methods

Study Design

Between August and December 2021, a pretest-posttest educational intervention study was conducted with two groups: an intervention group that used the flipped classroom approach, and a control group that followed traditional classroom methods.

Participants

Eligibility Criteria for Participants

The inclusion criteria for the study were all fourth-grade students enrolled in a male-only elementary school in Shiraz, Iran, during August-December 2021. This decision was made to maintain homogeneity in the study groups, as it is a cultural norm in Iran and provides easier access to participants. Only students who were willing and able to participate in the study and were not guest students during the semester were included in the study. Those who were unwilling to continue their cooperation were excluded from the study.

Teaching Interventions

The intervention includes preparing teaching materials, choosing an approach, and implementing it. An e-learning specialist and an educational technology student with 10-

20 years of teaching experience collaborated to develop content and train the students in science. The learning objective of this course was to develop the students' learning about science and educational motivation. The educational content was derived from the Iranian Textbook for fourth grade of elementary school for science subject.

After completing the pretest, the intervention group received access to the Learning Management System (LMS) and eight weeks of multimedia content for their lessons, consisting of written, visual, and audio materials tailored to a teaching scenario. The multimedia content was created using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model (3). The interactive content included questions with embedded options that allowed the learners to receive necessary feedback from the system. Correct answers kept the learners on the main track of the lesson, with additional information provided to enhance their knowledge, while incorrect answers led to sufficient explanations and the supplementary information section. One week before each in-person class, multimedia content for the next session was delivered to students, who were asked to study the content and email the generated code at the end of the lesson to their teacher after completing the lesson and answering inter-lesson questions.

In total, eight two-hour in-person classes were held over eight weeks, with instructors providing learning goals, short presentations, and open-ended questions. Participants engaged in small-group discussions to find the answers, with the instructors acting as facilitators, guiding and encouraging individuals to participate.

In the control group, traditional teaching methods (lecture, question-and-answer, and group discussion) were used with the same flipped classroom content available in the intervention group. It is worth mentioning that in both methods, the teacher and educational content were the same. One week after completing the training, participants in both groups completed the posttest, and at

the end of the study, educational content was made available to the control group.

Data collection tools: The students' level of learning and motivation was assessed both before the training sessions began and again one week after they completed the sessions. The data collection tool consisted of:

Demographic information: Demographic information included the students' age and the educational and economic levels of their parents.

The Harter Academic Motivation: The questionnaire was developed by Harter in 1981 as a standardized tool to measure academic motivation in students. It contains 33 items that assess both intrinsic (n=17) and extrinsic (n=16) motivations. Intrinsic motivation is characterized by an inherent desire or interest in learning and is made of three factors: Preference for Challenge (engaging in academic activities because they are challenging and stimulating), Curiosity/Interest (engaging in academic activities because they are interesting and arouse curiosity), and Independent Mastery (engaging in academic activities to learn and develop mastery in the subject matter). Extrinsic motivation, on the other hand, refers to external factors that motivate a student, such as rewards or grades. The extrinsic motivation subscale consists of three items: Preference for Easy Work Assigned (the extent to which students are motivated by work that is perceived as manageable or not too challenging), Pleasing the Teacher/Getting Grades (the extent to which students are motivated by the desire to please their teacher or obtain good grades), and Reliance on Teacher's Judgment (the extent to which students are motivated by their teacher's feedback or evaluations to succeed academically). To assess the level of intrinsic and extrinsic motivation, the questionnaire employs a five-point Likert scale that ranges from 1 (completely disagree) to 5 (completely agree).

The questionnaire has been found to have high internal consistency, with a Cronbach's alpha coefficient of 0.92 for the intrinsic

motivation subscale and 0.84 for the extrinsic motivation subscale. The Harter academic motivation questionnaire has been found to have good construct validity (17).

Learning achievement: To collect data on students' learning of science, the researchers developed a questionnaire consisting of 20 multiple-choice questions. The internal consistency of the test questions was examined for each question, and an acceptable consistency was obtained. The face and content validities of the questionnaire were evaluated by 20 specialized teachers who were familiar with test construction, and it was found to be valid. The questionnaire had a content validity index (CVI) of 0.80 and a content validity ratio (CVR) of 0.92. It also showed good reliability, with a Cronbach's alpha coefficient of 0.83.

Sample Size and Randomization

The researchers conducted a pilot study and determined a power of 84% and a confidence level of 95% ($\alpha=0.05$) for their analysis. Based on these findings, a sample size of 30 was

calculated for both intervention and control groups. Permission was obtained from the Education Department to conduct the study in two schools to prevent information transfer between the students. The schools were selected for their convenient accessibility to the researchers, with one school using the flipped classroom method and the other school using traditional teaching methods. By the use of a simple random table, 30 students were randomly assigned to each group in either school.

Statistical Analysis

The data were examined using descriptive and analytical statistical tests in IBM SPSS v 22. To evaluate the effect of the intervention, we performed independent T-test, paired T-test and analysis of covariance (ANCOVA). P-value<0.05 was considered as an acceptable significance level.

Results

60 students were selected using convenience, and those who met the criteria

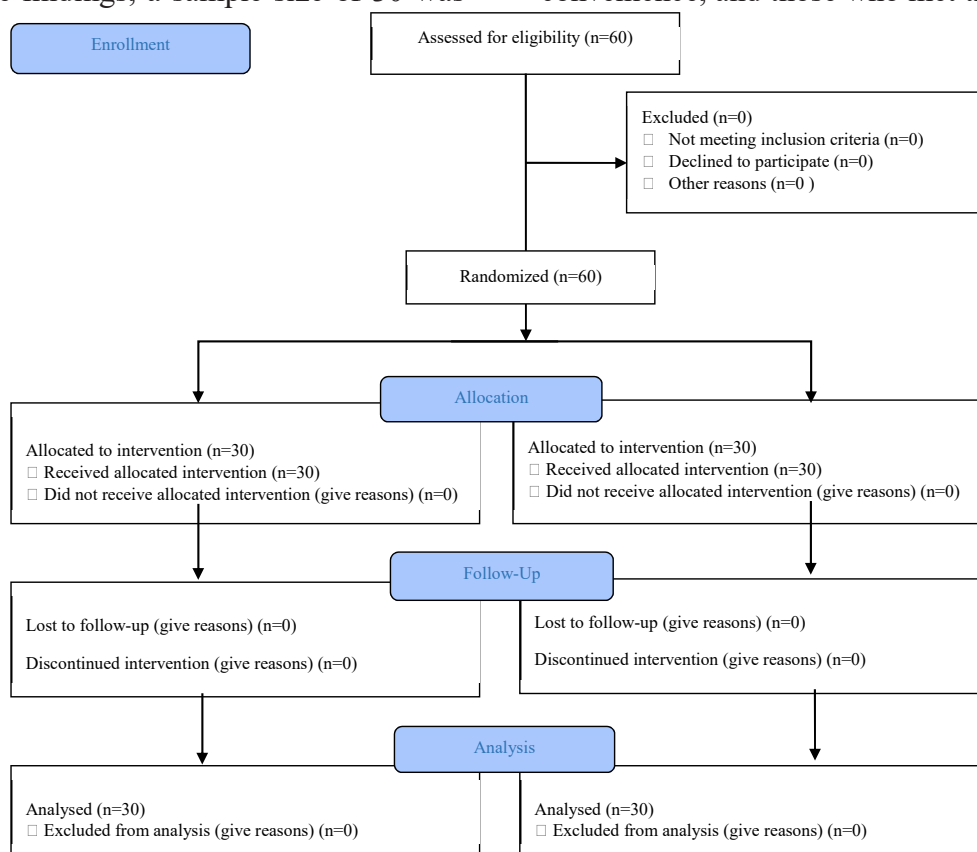


Figure 1: The student's recruitment flow diagram.

were randomly assigned using a simple random table. The study used a “Chi square” test to analyze the frequency distribution of age and the educational and economic levels of their parents. The results indicated that there was uniformity between the two groups, with a p-value greater than 0.005. The participants were divided into two groups, intervention and control, using a “parallel” design, as shown in Figure 1. The intervention group received flipped classroom, while the control group received traditional method. All of the participants who were randomly assigned successfully finished the study and the follow-up evaluation.

The learning and academic motivation scores in the intervention and control groups were evaluated and compared before and one week after the intervention (Tables 1 and 2).

As shown in the table above, the mean±SD of learning achievement scores before the intervention were 14±5.60 and 14±5.42 in the intervention and control groups, respectively, with no statistically significant difference (P=0.99). However, after the training, the level of learning achievement scores in the flipped classroom group increased compared to the control group (18±4.60 versus 15±5.90, P=0.03).

The mean±SD of academic motivation scores in the intervention and control groups were 108.48±12.73 and 107.43±12.03, respectively, with no statistically significant

difference (P=0.74). However, after the training, the level of academic motivation scores in the flipped classroom group increased compared to the control group (124.03±11.33 versus 108.01±11.99, P<0.001). Overall, the results indicate that the flipped classroom had a significant effect on the learning and academic motivation of elementary students (P<0.001 and P<0.001).

The impact of the flipped classroom on different dimensions of academic motivation, including Social Information Processing, Social Awareness, and Social Skills, as well as emotional intelligence, such as intrapersonal skills, coping with stress, adaptability, and general mood is shown in Table 3.

Before the intervention, there were no significant differences between the flipped classroom and control groups in any of the subscales or total scores for academic motivation, as shown in the table above. However, after the intervention, the mean scores for students' intrinsic motivation in the flipped classroom group increased significantly in the areas of preference for challenging academic tasks, focus on students' curiosity, and tendency towards independent mastery as opposed to the control group (P<0.001). In terms of extrinsic motivation, the preference for easy work had a positive and significant effect on students in the flipped classroom group (P<0.001), while no significant differences were observed in other

Table 1: Within- and between-group Comparison of the Learning Achievement Scores in Intervention and Control Groups before and after the Educational Intervention

Intervention Group	Control Group Mean±SD	Flipped classroom Mean±SD	Between-group comparison
Pre-test	14±5.42	14±5.60	0.99
Post- test	15±5.90	18±4.60	0.03
Within-group comparison	0.29	<0.001	---

Table 2: Within- and between-group Comparison of the Academic Motivation Scores in Intervention and Control Groups before and after the Educational Intervention

Intervention	Control Group Mean±SD	Flipped classroom Mean±SD	Between-group comparison
Pre-test	107.43±12.03	108.48±12.73	0.74
Post- test	108.01±11.99	124.03±11.33	<0.001
Within-group comparison	0.80	<0.001	---

Table 3: Within- and between-group Comparison of the Academic Motivation Subscale Scores before and after the Educational Intervention

Dimensions	Sub-Dimensions		Control Group Mean±SD	Flipped classroom Mean±SD	P value
Intrinsic Motivation	Preference for Challenge	Pre-test	26.93±4.61	27.90±4.35	0.40
		Post- test	27.03±4.73	31.66±3.99	<0.001
	Within-group comparison		0.90	<0.001	---
	Curiosity/Interest	Pre-test	9.53±3.13	9.05±3.11	0.55
		Post- test	9.89±3.25	11.20±2.87	0.10
	Within-group comparison		0.54	<0.001	---
	Independent Mastery	Pre-test	15.86±2.79	16.80±2.99	0.21
Post- test			15.97±2.55	19.33±2.30	<0.001
Within-group comparison		0.82	<0.001	---	
Extrinsic Motivation	Preference for Easy Work Assigned	Pre-test	22.93±3.83	21.66±3.73	0.20
		Post- test	22.74±3.89	28.54±3.01	<0.001
		Within-group comparison		0.79	<0.001
	Pleasing the Teacher/ Getting Grades	Pre-test	18.93±3.78	18.66±3.39	0.77
		Post- test	18.74±3.71	18.54±3.18	0.82
	Within-group comparison		0.78	0.84	---
	Reliance on Teacher's Judgment	Pre-test	107.43±12.02	108.48±12.73	0.74
Post- test		108.01±12.73	108.01±11.99	0.99	
Within-group comparison		0.80	0.83	---	

areas of extrinsic motivation, such as Pleasing the Teacher/Getting Grades and Reliance on Teacher's Judgment. This suggests that our intervention had a beneficial effect on these aspects of academic motivation.

Discussion

The aim of this research was to investigate how the flipped classroom approach impacts the academic motivation and learning achievement of elementary school students. The findings revealed that this method had a significant positive effect on the students' learning level. Moreover, the results showed that the score for the academic motivation in the flipped classroom group significantly increased in preference for challenging academic tasks, focus on students' curiosity, tendency towards independent mastery, and preference for easy work subscale compared to the control group.

The flipped classroom approach can lead to better academic performance due to several reasons. Firstly, it enables the students to learn at their own pace and in a self-directed manner, which can enhance their engagement and motivation (18). Secondly, it provides the students with more resources

and support outside the classroom, such as online lectures, videos, and interactive activities (3). Thirdly, it encourages active learning and collaboration during class as students have already been exposed to the material beforehand and are better prepared to participate in discussions and problem-solving activities (19). Lastly, it facilitates a deeper comprehension of the subject matter, as students have the opportunity to review and revisit the material as many times as necessary to fully grasp the concepts (20).

This educational program incorporated several factors to increase the students' academic motivation in a functional format. Initially, instead of traditional lectures in the classroom, students learned the course material through instructional videos and images at home. After learning the material, a virtual and face-to-face environment was provided for group discussions, which led to a more enjoyable learning experience and better achievement (5, 6). This approach allowed the students to move away from repetitive teaching methods and provided them with an exciting way to learn course material and participate in class, resulting in increased motivation to complete assignments and attend classes on

time (21). Furthermore, the program provided the students with a considerable amount of freedom and autonomy in learning the course material, thereby enhancing their ability to learn independently. (22). Undoubtedly, this factor stimulated the academic motivation of the students and raised their level of engagement. Overall, the implementation of these factors significantly enhanced the students' academic motivation and led to better academic performance.

Other studies in this area also highlight that training using the flipped classroom method can have a significant effect in comparison to traditional methods by enhancing the students' learning outcomes (23), engagement (13), self-efficacy (24), and attitude (25).

The study revealed that the implementation of the flipped classroom approach had a significant positive impact on the students' intrinsic academic motivation, as measured by various subscales. Specifically, students in the flipped classroom group exhibited a higher preference for challenging academic tasks, indicating their willingness to take on difficult assignments and challenges in their coursework (26). Also, these students showed a stronger focus on their curiosity, indicating a greater desire to learn and explore new ideas. The flipped classroom approach also resulted in an increased tendency towards independent mastery, as students became more likely to take ownership of their learning and strive towards mastering course material on their own. In this regard, a study conducted by academic motivation demonstrated that flipped classrooms can be particularly effective in enhancing the students' intrinsic motivation, which is driven by their own interest and enjoyment of the learning process (27). In addition, the flipped classroom approach resulted in an increased preference for easy work, which is a subdimension of extrinsic motivation. This finding suggests that students found the learning experience more engaging and enjoyable, which may have contributed to their increased motivation (28). However, in this study, there was no significant relationship between Pleasing

the Teacher/Getting Grades and Reliance on Teacher's Judgment with the students' academic motivation.

The results of this study suggest that intrinsic factors are more strongly related to students' academic motivation than extrinsic factors such as desire to please the teacher or receive high grades. This is because intrinsic motivation is driven by an individual's inherent interest and enjoyment of a task, while extrinsic motivation is driven by external factors such as rewards or punishments. Moreover, when students feel that they have a sense of control over their learning and are supported in their efforts, they are more likely to feel motivated and engaged in the learning process. In contrast, a focus on pleasing the teacher or achieving good grades may create pressure and anxiety, which can detract from students' intrinsic motivation to learn (27, 28). Overall, these studies suggest that creating a supportive, autonomous learning environment that fosters intrinsic motivation is key to promoting the students' academic motivation and engagement. Overall, these findings suggest that the flipped classroom approach can be an effective way to enhance the students' academic motivation and engagement.

Limitation and Suggestion

A limitation of the present study is the relatively small number of participants. Therefore, the authors recommend that future research should investigate the flipped classroom using a larger sample size to enhance the generalizability of the findings.

Conclusion

In this study, it was found that the level of learning and academic motivation was higher among the group that used the flipped approach compared to those who used the traditional method. Consequently, based on these findings, it is recommended that the flipped approach should be adopted for better learning outcomes and academic motivation.

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Authors' Contribution

NZ and GS devised the study concept, designed the study, ran the study intervention, data collection and analysis, participated in the coordination of the research, writing and critically revised the manuscript. All authors have read and approved the content of the manuscript.

Conflict of Interest: None declared.

Ethics Approval and Participants Consent

The present study was approved by the local ethics committee of Shiraz University of Medical Sciences (decree code: IR.SUMS.REC.1398.894). Following ethical principles, the researchers explained the aims, methods, and conditions of the study to the participating, and written informed consent was obtained from them. Participants were assured of the confidentiality of their data, and that only general statistics would be presented.

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