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**Original Article**

# Investigating the Effect of Flipped Classroom and Jigsaw Method on Students' Learning and Academic Engagement

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## Abstract

The aim of this study was to investigate the effect of flipped classroom with Jigsaw method on students' learning and academic engagement of seventh grade students in Persian literature course. The method of the present study was experimental and the educational operation was performed in three experimental groups (1- The combination of flipped classroom and jigsaw 2- flipped classroom 3- jigsaw method) and the usual method in the control group for eight sessions. The statistical population of the study was all seventh-grade students of the first secondary school in Karaj, in the academic year of 2020-21. From the statistical population, 100 students were selected voluntarily by available sampling method and randomly assigned to the groups. The research instruments were Zarang Academic Involvement Questionnaire (2012) and researcher-made learning test. ANCOVA, ANOVA and MANCOVA tests were used to analyze the data. The results of the analysis showed that the combination of flipped classroom and jigsaw was effective in promoting learning (sig=0.012) and academic engagement (sig=0.001). The flipped classroom method was not effective in students' learning (sig=0.894) and academic engagement (sig = 0.970). Jigsaw method, not effective in promoting learning (sig = 0.783), but was able to significantly engage learners in educational activities (sig = 0.001).

## Keywords

academic engagement, collaborative learning, Flip-J, teaching methods.

## Introduction

Following Due to the rapid growth of technologies in the current era in the design and implementation of learning-teaching methods, new trends have emerged that are more effective and efficient. In addition to this, in new learning environments, new web-based learning resources and opportunities are provided to learners [1]. In online networked learning environments, the rapid expansion of interactive technologies in education has been used for innovative approaches of exploration and research, cooperative learning. Education in this environment, instead of teacher-centered education, has seen progress in alternative approaches [2].

With the rapid spread of COVID-19 pandemic worldwide, educational institutions have decided to transit to an online paradigm for providing educational services and to communicate with students through using emerging technologies [3] [4]. The design of virtual classes was not enough time to prepare some of the problems caused by the sudden change from traditional to online education. Many teachers and students still had the habit of

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attending classes in person even though all theoretical classes were transferred online [2]. In this situation, teachers, as managers of online learning, should seek to improve their information technology literacy and use new educational strategies to increase the willingness of learners. In distance education, the spontaneity and independence of learners is essential. In innovation-based education, inspiration and mindset are considered as primary indicators of enthusiasm for continuing education [5]. In this regard, with the emergence of new approaches centered on the needs of students, educators have sought to re-evaluate educational practices to shift the focus away from them and students, foster practical thinking, enhance digital skills, and student engagement. to encourage [6]. Flipped Learning (FL) method was one of the blended learning models that was used in transferring learning content as it makes learning active, effective, and assures learner's positivity by engaging the learner and the collaboration it offers [7,8]. FL methodology implements educational activities by applying knowledge via communicating with peers and assessing desired learning outcomes [9]. In this method, before the classroom teaching is done, the teacher uses technology to prepare an educational content and provide it to the students [10]. By using this method, learners, especially those who need more time and practice, can review the material according to their learning speed and learn new concepts and knowledge [11].

On the other hand, today it has become important to work in networks and teams to solve complex problems. Therefore, cooperative learning methods have attracted attention. [12]. One of these methods that is attractive to learners is the jigsaw method. In this method, learners in small groups are responsible for doing a part of a larger task. Each member of the group studies a part of the work and then a new group is formed from each group of people who have studied the same part. They give and discuss about their part. Then they return to their groups and teach their fellow groups [13]. In this method, due to the fact that all learners interact with each other and strive for a common goal, compared to methods based on competition, their motivation increases [14]. URAL & ERCAN considered the jigsaw method as an effective way to improve students' academic achievement [15].

For some students, the Literature lesson is not popular due to the presence of words beyond their knowledge and complex meanings and poems that are hard to understand and unattainable in some cases, and due to the presence of Persian grammar, the difficulty and evasiveness of its contents. Also, many students do not know how to use these materials, and weakness in one grade leads to weakness in higher grades. Also, the general weakness in the Persian literature course can have a great impact on the lack of learning of other courses as well as the correct transfer of students' knowledge during evaluation.

As mentioned earlier, the COVID-19 pandemic has caused numerous challenges in teaching-learning affairs. In this context, instructors try to find methods to maintain and improve students' learning and academic engagement. Based on the studies conducted on the issue, online learning [16, 17] and flipped classroom [18, 19] are amongst the most widely-used virtual education methods. Considering the advantages and disadvantages of each of these methods, the combination of flipped classroom and jigsaw method was investigated as a new method using in the present study. This study aimed to investigate the effect of flipped classroom with Jigsaw method on students' learning and academic engagement of seventh grade students in Persian Literature course.

## Methodology

### Study design

This research is practical in terms of purpose and experimental in terms of method. It is also quantitative in terms of data type. Questionnaires and tests have been used to collect information. The volunteers to participate in this research were randomly divided into four groups: jigsaw, flipped classroom, flipped- jigsaw (Flip-J) classroom and control group. In

the jigsaw group, after teaching how to perform, in the form of live broadcasting and providing instructions, the students discussed and exchanged opinions in their expert groups and each worked on one of the topics related to linguistic knowledge and one of the literary arrays. After completing the knowledge in expert groups, they returned to the main groups and shared their information. In the flipped class group, the students received the training of literary arrays and language knowledge in the form of educational videos, and in the face-to-face class that was held online, they presented their assignments and discussed the topic of teaching. In the Flip-J class group, teaching and presentation of instructions were done in the form of educational videos and sharing of related links. After receiving the related files, each group learned about their tasks and topics. Then, according to the subject assigned to him, each student collected information and completed the assignments. Finally, according to their subject, the students went to expert groups and after sharing information, they returned to their groups and taught their cohorts. In the control group, teaching was done only directly (live broadcast). All the students present in this study participated in the pre-test and post-test of learning and answered the academic engagement questionnaire. It is worth mentioning that due to the spread of the Covid-19 virus and the inability of students to attend schools, all the stages of this research have been implemented in the Shad application.

**Sampling**

The statistical population of the research was all the seventh-grade students of the first secondary school, Saman Alaima Boys' High School, in Karaj, with an approximate number of 300 students, of which 100 volunteers participated in this project using a simple random method, 25 students in the jigsaw class, 25 students in the flipped classroom. 25 students were divided into flip-j class and 25 students were assigned to control class. The school in this research was a governmental school and it is located in Mehshahr Karaj. The teachers of this school have at least a bachelor's degree in their specialty, and at most a master's degree. From a technical point of view, the classes are equipped with a projection screen and a video projector, and all students have access to mobile phones and Shad software due to their participation in virtual classes.

**Research tools**

The following tools were used in this research:

- Academic engagement questionnaire
- Learning pre-test
- Learning post-test

The academic engagement questionnaire was developed by Zarang [20] based on theoretical foundations (Linen brink & Pint rich's theoretical model [21]) and was used to measure academic engagement. This scale has three dimensions (cognitive, motivational and behavioral). Its cognitive dimension is measured with 19 items, its motivational dimension is measured with 10 items, and its behavioral dimension is measured with 9 items, making a total of 38 items. A researcher-made test was used to check the learning rate.

**Data Analysis**

In the current research, to analyze the data in the descriptive part of the descriptive statistics including: frequency, frequency percentage, mean, standard deviation and in the inferential part to check the dependent variables from univariate analysis of covariance test (ANCOVA), one-way analysis of variance (ANOVA) and analysis of variance. Multivariate (MANOVA) was used.

## RESULTS

Before testing the hypotheses, one should test the normality of the data distribution. This helps the researcher to choose the appropriate statistical test to test the hypotheses. For this purpose, the Kolmogorov-Smirnov test was used to determine the type of data distribution. For this purpose, the distribution of the data related to the research variables at the significance level of 0.05 have been examined, the results of which are shown in Table 1.

**Table 1.** The Results OF the Kolmogorov-Smirnov Test to Check the Normality OF the Distribution of scores

| variable | Z Kalmogrov Ismirnov | significance level |
|---|---|---|
| learning | 0.107 | 0.185 |
| cognitive | 0.043 | 0.989 |
| behavioral | 0.083 | 0.447 |
| motivational | 0.092 | 0.334 |

Based on the results listed in the table, the significance level of the calculated statistics for all variables is greater than 0.05, so the assumption of normal distribution of pre-test and post-test scores is accepted.

In order to compare the effectiveness of the methods used on students' learning in the 7th grade Persian literature course, one-way analysis of covariance (ANCOVA) test was used. The results of this test are shown in Table 2.

Table 2 shows the results of analysis of covariance to compare learning scores in the control, flipped class, jigsaw and Flip-J groups in the post-test stage. The F value obtained is equal to 3.374 and its significance level is less than 0.05 (P>0.05). Therefore, the null hypothesis is not confirmed and the research hypothesis that there is a difference between the effectiveness of teaching methods on students' learning is confirmed.

**Table 2.** Results of Covariance Anal ysis to Compare Learning Between Groups in the Post-Test Phase

| variable | sum of squares | df | Mean squared | F | significance level | Effect size |
|---|---|---|---|---|---|---|
| pre-test | 394.467 | 1 | 394.467 | 31.835 | 0.001 | 0.251 |
| group | 152.424 | 3 | 41.808 | 3.374 | 0.022 | 0.096 |
| error | 1177.133 | 95 | 12.391 | | | |
| Total | 1728.160 | 99 | | | | |

In order to pairwise compare the groups with each other, Ben Feroni's post hoc test was used and the results are presented in Table 3.

**Table 3.** Bonferroni Post Hoc Test

| Dependent variable | Group 1 | Group 2 | Mean difference | standard error | significance level |
|---|---|---|---|---|---|
| learning | Control | Flipped class | -1.460 | 1/003 | 0.894 |
| | | Jigsaw | -1.519 | 0.996 | 0.783 |
| | | Flip-J | -3.167 | 0.996 | 0.012 |
| | Flipped | Jigsaw | -0.059 | 1.006 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | class | Flip-J | -1.707 | 1.008 | 0.562 |
| | Jigsaw | Flip-J | -1.648 | 0.996 | 0.608 |

According to the results of Ben Feroni's follow-up test, the difference between the average learning scores between the two Flip-J control groups in the post-test stage is significant (P<0.05) and the students' learning in the middle Persian literature course of the seventh grade in the Flip-J method is more compared to the students in the control group. The difference between the amount of learning It is not significant among other groups (P<0.05).

In order to compare the methods used on the academic engagement of students in the 7th grade Persian literature course, the analysis of variance (ANOVA) test was used. The results obtained are shown in Table 4.

**Table 4.** Analysis of variance Test to Compare Academic Engagement Between Groups

| variable | Source | sum of squares | df | Mean squared | F | Signifi-cance level | Effect size |
|---|---|---|---|---|---|---|---|
| Academic engagement | between groups | 9997.960 | 3 | 3332.653 | 13.9 | 0.001 | 0.304 |
| | error | 22898.880 | 96 | 238.530 | | | |
| | Total | 32896.840 | 99 | | | | |

Table 4 shows the results of the analysis of variance test for the comparison of educational engagement in the control, Flip-J, jigsaw, and flipped class groups. According to the results presented in the table, the F value obtained was equal to 13.972 and it is significant at the 0.01 level (P < 0.01). Therefore, the null hypothesis is not confirmed and the research hypothesis is confirmed.

In order to pairwise compare the groups with each other, Ben Feroni's post hoc test was used and the results are presented in Table 5.

**Table 5.** Bonferroni Post Hoc Test

| Dependent variable | Group 1 | Group 2 | Mean difference | standar d error | significance level |
|---|---|---|---|---|---|
| Academic engagement | Control | Flip-J | -24.360 | 4.368 | 0.001 |
| | | Jigsaw | -20.440 | 4.368 | 0.001 |
| | | Flipped class | -6.160 | 4.368 | 0.970 |
| | Flip-J | Jigsaw | 3.920 | 4.368 | 1 |
| | | Flipped class | 18.200 | 4.368 | 0.001 |
| | Jigsaw | Flipped class | 14.280 | 4.368 | 0.009 |

According to the results of Ben Feroni's post hoc test, the average scores of the control group's academic engagement are significantly lower than the average scores of the students in the Flip-J and Jigsaw groups. Also, the average grades of the flipped classroom group are significantly lower than the average grades of students in the Flip-J and Jigsaw groups.

## DISCUSSION

In this research, the effect of the divided flipped classroom method (Flip-J) on the learning and academic engagement of seventh grade students in Persian literature was investigated. In the following, we will examine the two main questions of the research.

What effect does the combination of flipped class and jigsaw method (Flip-J) have on the learning of seventh grade students in Persian literature?

As shown in Table III, the average learning score after the intervention (by controlling the previous score) in the Flip-J group is higher than the control group, which is statistically significant. As a result, using the flipped classroom method along with jigsaw has a significant effect on the learning of seventh grade students in Persian literature. Also, in the study of the difference in the learning score in the Flip-J group with other groups, although there is a difference between the mean of the Flip-J and Jigsaw groups and also between the mean of the Flip-J group and the flipped class, this difference is not statistically significant. Few researches have been conducted in this field and the results of this research are in line with the results of the researches of Akniteh et al. [22], Yamada and Goda [23] and with the results of the researches of Rombot and Doringin [24] has been in conflict. Aknite et al. [22] concluded that the Flip-J method provides an opportunity to learn engineering concepts, encourage creative thinking, and strengthen students' communication skills. Davo et al. also cited the Flip-J method as the reason for increasing the learning rate of nursing students. Also, Yamada and Goda [23], in a research aimed at developing a language learning system, report that Flip-J supports learning-related behaviors in language teaching. Along with the changes and rapid growth of technology, students need an active and appropriate learning model. And due to the spread of Corona disease the requirement to continue teaching-learning activities in the Shaad application, this learning model was intended to ensure the effectiveness of the students' activities. It seems that the advantage of the current research is that the combination of the flipped classroom and the jigsaw method can to some extent solve the problems of students' learning in virtual education. The jigsaw method, by turning the competitive atmosphere into cooperation, has been able to respond to the needs of students in relation to the existence of an effective model in virtual education.

What effect does the combination of the flipped class and the jigsaw method (Flip-J) have on the academic engagement of seventh grade students in the Persian literature course?

As can be seen in table V, the average score of academic engagement in the Flip-J group is higher than the control group, which is statistically significant. As a result, using the flipped classroom method along with jigsaw is effective on the academic engagement of seventh grade students in Persian literature. Also, in the examination of the difference in the score of academic engagement in the Flip-J group with other groups, although there is a difference between the mean of the Flip-J and Jigsaw groups, this difference is not statistically significant. Also, there is a difference between the mean of Flip-J group and the flipped classroom, and this difference is statistically significant. Although the researches conducted in relation to Flip-J have not measured the variable of academic involvement, some studies have reported similar cases with emotional, behavioral and cognitive involvement of learners, which is somewhat in line with the results of this research. Sánchez-Movens et al. [25] combined flipped classroom and jigsaw method in a research called a combined strategy for developing real life skills. They found that this combination is associated with the development of competencies such as teamwork and self-learning processes of students. Dewitt & McLuskie [26] in an article titled " Flipping the Jigsaw" point to results such as increased student interaction, increased understanding and expansion of topics, demonstration of critical discussion skills, and increased intellectual stimulation and attractive education of students from seventy percent to eighty-six percent. Poloju et al. [27] mention the use of jigsaw method in flipped learning in an article entitled using new technology in teaching and learning. The results of this research point to the increase in the speed of students in understanding concepts, increase in interactions and development of communication skills, and the satisfaction of students with this method.

## CONCLUSION

During the epidemic of the Covid-19 virus, all schools in the world faced a challenging educational situation. Therefore, the use of innovative solutions was needed to optimize educational efforts. In this research, virtual education based on Flip-J was designed and implemented because students should have an active role in learning. be challenged to think more deeply and make connections between lesson concepts. The findings of the present research show that the combination of flipped classroom and jigsaw methods has significantly improved the level of learning and cognitive, behavioral and motivational engagement of students. Using this method for online training on the Shad platform has been effective. Taking advantage of the benefits of the reverse class, students do not have to worry about losing class time and internet problems in order to receive the desired content. With the content in hand, they can watch educational videos according to their learning speed and repeat them if necessary. Also, the addition of the jigsaw method increases the independence of learners and encourages them to carry out activities with higher levels. It seems that the level of videos presented in the flipped class is related to the level of students' involvement with the content, the higher the educational videos are. be, the desire of learners to explore and collect information has decreased and the lower their level is, the learners face problems in deep learning, which is supposed to occur during the activities. One of the main reasons for the superiority of the Flip-J method over the traditional method has been the students' understanding of their assignments. Flipped learning has positively led to more focus on the task. When students watch the lesson video for a certain period of time, they better predict the amount of homework. In the jigsaw and traditional experimental group, students often did not know what to do in relation to their homework when they left the class, because they did not understand what happened in the class. In the Flip-J experimental group, students build their learning base by watching movies and when they go to class, they learn better and deeper in expert and main groups. It is also possible that the use of the flipped method has expanded the cooperation of parents. It seems that with the availability of teaching videos, parents have found the possibility to help their children in doing their homework and have improved the effectiveness of their activities while doing the jigsaw method. On the other hand, it seems that teachers in a SHAD program, in teaching in the form of live broadcasting, have taught a lot of content and have no desire to allow learners to choose the content of learning and how to learn it. Bergman and Sams [28] regarding the choice Content for reverse education, they emphasize that when we give our learners the opportunity to choose the subject of learning and how to learn it, there is a curiosity component. Students should have the opportunity to choose the things they are interested in learning, and find the opportunity to search for topics themselves. Of course, it is important to pay attention to the fact that giving absolute discretion and control to learners in the learning process is not the best option. Therefore, it seems that considering the insignificance of the learning created in the experimental group of the flipped class and the jigsaw group, the jigsaw method added to the flipped class, along with the facilitating role of the teacher, has been able to guide the curiosity of the students in the direction of deep learning. Also, in relation to the higher difference in the learning score in the Flip-J group compared to other groups, it seems that presenting the content in the form of a reverse class and guiding and supporting the teacher in doing the jigsaw steps leads to subsequent learning. If we consider deep learning to mean a more comprehensive and complete understanding of the content, the next learning has a broader view of the content. In fact, meaningful learning is created when the learner has enough motivation to cooperate until the last training session, and by completing his tasks, he completes the learning cycle of his other cohorts. It seems that by providing teaching and instructions in the form of educational videos, before doing the jigsaw method, teachers help students to overcome the worry and anxiety caused by learning, a way that ultimately leads to their subsequent learning. In the language of education, the Flip-J is a way to respect the individual differences,

preferences and educational needs of students and increase the likelihood of their learning in an online learning environment. We create a classroom where content is important, but at the same time, a place where students have choices about how they explore content and move forward with their activities. The divided inverted class provides the possibility of individualization in the class and engages students in motivational, cognitive and behavioral fields.

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