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Comparing the Effect of Backward Education and Passive Teaching Methods on Learning Experimental Science Course of Seventh Grade Female High School Students

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ABSTRACT
The present study aims to compare the effect of backward teaching and passive teaching methods on learning the seventh-grade experimental science course (junior high school). The research method is quasi-experimental with a pretest-posttest design. This study's statistical population is all seventh-grade female students of Kaj's first secondary school, Pasdaran Effat Girls' High School, which has four classes with a total of 128 pupils in the years 2021-22. The one-step cluster random approach was used for sampling. In the course of the experimental science, a statistical sample size of two seventh grade classes was investigated after balancing the topics, one in the form of passive learning with 30 people and the other in the form of backward education with 32 people. The learning rate of the groups was measured using an academic achievement exam. Teachers, professionals, and educational specialists' opinions were utilized to assess the questionnaire's content validity. The statistical data of the hypotheses were analyzed using an analysis of covariance. The findings of the test analysis revealed that in both the experimental and control groups, there was a significant difference in the scores of simple in-depth and simple superficial learning. In other words, the backward teaching approach is more successful than the passive teaching method in enhancing pupils' general, deep, and atomic (superficial) learning.
Keywords: Backward education, Passive teaching method, In-depth (lasting) and atomistic (superficial) learning, Experimental sciences.

Introduction

1. Introduction

The ability to learn is one of the most significant human traits. Learning provides access to a large amount of human knowledge. Human attempt to learn and acquire knowledge has resulted in progress and civilization, as well as access to present technological technologies. According to trustworthy projections, owing to the quick changes and developments in science and technology, 21st-century human beings will always encounter new challenges, and these issues will produce a form of struggle and anxiety about how to live. He must be certain that he can solve all of his difficulties with the proper training and continue his life in the face of fast change in order to strike a balance with new concerns. Change in educational approaches and activities will be one of the essential responsibilities for educational systems in such situations. Educational systems should prioritize the development of thinking, creative, and critical thinkers, as well as the training of people who can solve difficulties and untangle the knots and challenges in their life (Attaran, 2014).

Regrettably, in many educational systems, undesirable habits have thrived in the teaching process as a result of rapid expansion and development of schools and the use of non-specialized and untrained

executive forces, particularly those bad habits that have replaced students' thinking, interaction, and participation in the classroom, depriving them of any freedom of thought, criticism, or innovation, and instead of using new teaching methods, they insist on using traditional pedagogical methods. As a result, one of the most critical changes in the educational system is a shift in the mindset and teaching methods of instructors and educational system executives (Shabani, 2020). Teachers play an important part in the learning process, and it is critical to give ways that encourage students to be engaged and think. Only the instructor has an active involvement in the teaching process and pre-determined content in the passive teaching approach. In class, he speaks orally, and the pupils don't seem to notice. In other words, the student is there for the school, not the other way around. Passive instruction sees its sole purpose as accumulating material in the student's memory, embellishing it with knowledge, and adorning it with excellent ideas (Hassani Jafari, 2018).

The passive teaching technique is an explanatory teaching style that uses printed materials such as books and pamphlets or lectures to give knowledge directly to pupils. In this technique, the instructor explains the content to the students and offers the principles and answers; in other words, the teacher gives the students all of the material that may be offered to them. One of the most significant benefits of the explanatory approach is its emphasis on the transmission of educational content, i.e., its emphasis on performing primarily memorizing tasks and fulfilling the teacher's guiding and regulating responsibilities. The teacher strives to give many examples throughout the subject so that students may generalize the concepts and principles and apply them to new circumstances. Through practice, the instructor also challenges pupils to check and examine their own learning. Students are also encouraged to practice individually with the help of the teacher. Before presenting and discussing the new curriculum, the teacher should carefully evaluate the framework for preparing the lesson. The information for the beginning of the lesson defines the lesson's aim, techniques, and the substance of the sequential learning experiences. Such content at the start of the session is connected to boosting students' academic success and learning activities (Joyce et al., Translated by Mehr Mohammadi, 2020).

The disadvantage of this approach is that the student gets the content already prepared and is not actively involved in discovering the facts; as a result, atomic (superficial) learning occurs, in which the learner is forced to memorize the data, and learning is subsequently hampered (Shabani, 2012). Observations and measurements done in the classroom over the years demonstrate that in passive teaching techniques, a teacher spends roughly half of the class time alone, while in conventional teaching methods, the instructor spends half of the class time talking (Fallah, 2009).

Passive techniques aren't necessarily old or obsolete, and new methods aren't always desired or prevalent; thus old methods in today's education can't be fully dismissed in terms of implementation methods. However, many teachers are unsatisfied with their classes' inert atmosphere and dry, unrealistic settings and are seeking for a means to push pupils to learn and participate in educational activities (Majidiani, 2009). Curricula are currently structured and built in such a way that skill goal, content processes, and knowledge may all be attained at the same time. Experimental science principles are among the most crucial to comprehend and implement in everyday life. On the one hand, it is vital to building insight and profound insight into comprehending the world around us in order to establish the framework for the Almighty Creator's bowing via recognizing the magnificence of creation while teaching experimental sciences. However, given the increasing reliance of numerous elements of human existence on technological discoveries appears vital. As a result, given that experimental teaching sciences has traditionally been regarded as one of the most significant educational sectors in educational systems, it is crucial to construct programs that transfer learning to students while stressing the growth and development of thinking abilities and attitudes. We must also remember the evolution and advancement of notions

connected to experimental sciences in the context of active and exploratory approaches (Bergman and Sams, translated by Attaran et al., 2017).

Considering what was mentioned above, the teaching technique is backward classroom-style among the new and advanced teaching models that create meaningful or deep learning in learners, and there is a need to reevaluate passive ways and pay more attention to active teaching methods. This is one of the teaching strategies that has found a position in today's educational landscape. The location of the house and school is therefore altered. The reverse class is a hybrid of two fundamental educational elements: lecture and active learning. Students have access to the teacher's lecture videos before entering the classroom and receive them along with other instructional materials, giving them more time in the classroom to interact with other students face-to-face, collaborate with peers, and participate in activities with the teacher's guidance and immediate feedback (Kia Hosseini and Dosti, 2016).

During class time, the backward class method is a student-centered active teaching technique that includes group projects, exploratory and exploratory activities, experiments, and lectures. In this scenario, the information in the class will be enhanced. Students receive out-of-class lecture-based direct education in the form of online or offline videos (Huntela, 2014). Science is a task that students must investigate, experiment with, and observe in the world in order to learn. Students participate in sensory activities (manual, hands-on experience) in the classroom, and these activities are part of collaborative learning (in which students interact with one another) (Shahrtash et al., 2008). The goal of creating possibilities for pupils to learn through active classroom engagement is pursued in a reverse or backward classroom. Reverse learning is another educational approach in which direct learning is transferred from a group learning space to a personal learning space, transforming the group space into a dynamic and interactive educational environment that guides teacher-students in applying concepts and interacting creatively with the educational subject (Bergman and Samz, 2016). In other words, a thoughtfully supported educational process in which learning is done through electronic content designed as individual self-direction in the out-of-school environment and accelerates, deepens, and consolidates learning interactively and in groups through design activities is referred to as a backward class. It is accomplished in the school setting under the supervision and guidance of the instructor in accordance with the topic (Secretariat for the Promotion of Professional Skills of Teachers, 2016).

Literature review

In an applied study, Kaviani et al. (2015) examined the impact of the backward class on eighth-grade students' self-regulated academic success, group interaction, and motivation and discovered that the inverted class method had a favorable influence on all of the above dependent variables.

In a pretest-posttest type quasi-experimental study, Ismailifar et al. (2015) surveyed the influence of adopting the backward class approach on sixth-grade kids' sense of belonging to the school and found that the findings were good.

Maleki et al. (2015) investigated the impact of applying the backward teaching technique on eighth-grade students' learning in work and technology and discovered that the inverted teaching method was more successful than the regular (explanatory) teaching approach.

Mortazavi (2004) investigated the effectiveness of interactive teaching and learning methods in educational processes, concluding that using interactive teaching and learning methods in the teaching and learning process generates new enthusiasm in the classroom, increases student belief and expectation, student participation in classroom management, more reference to other textbooks, increases retention, and decreases classroom absenteeism.

In a research titled Implementing an Inverted Class: An Educational Plan, Shimamoto (2012) found that the backward or upside-down class approach is efficient in conveying educational content and that using it builds learners' confidence. Backward class is a great way to vary the way you get your training. Instead of giving sporadic lectures, teachers may now mix and employ engaging instructional approaches. The backward class can employ a variety of student-centered approaches.

At Niagara Falls High School, Ventry and Kilmer (2013) flipped math teachers' classrooms and used class time to undertake more practical exercises. They recorded their lectures and distributed them to students using cutting-edge technology and then invited students in the class to practice and apply what they had learned from the videos. Students were subsequently assessed (New York Standard Exam), and the results revealed that 85 percent of students completed the test satisfactorily, compared to 72 percent, 36 percent, and 54 percent for students of the same level in prior years.

Accordingly, with the advent of science and technology, as well as changing attitudes about learning, we have come to feel that the teacher's job is to give not only factual information but also the ideal environment for meaningful learning. According to previous research, the current study aims to compare the passive teaching style with backward or inverted teaching.

2. Method

Because it is impossible to totally control and change the variables, this study used a quasi-experimental (quasi-experimental) pre-test procedure with the control group.

3. Statistical community and statistical sample

The statistical population contains experimental sciences students in the seventh grade at Pasdaran Effat High School in Kaj during the academic year 2021-22. There are a total of 128 pupils in these four classes. A one-stage cluster random sampling procedure was used. As a result, the statistical sample size for the study is two classes of 30 and 32 persons, one of whom was taught using the passive learning technique and the other using the backward class method of experimental sciences, with each method being chosen at random for the classes.

4. Tools

The learning rate of the groups was measured using an academic achievement exam. The academic accomplishment exam was developed as a post-test and pre-test by the researcher in partnership with Ardal city's experimental sciences department and standardized from textbook material. The retest method was used on 30 people with a one-week interval to obtain the test's reliability coefficient (correlation coefficient), and the difficulty coefficient and clean coefficient of each of the questions were calculated, and questions with difficulty coefficients higher than 80% and lower than 20% were removed or revised. Before the main performance on a sample group, the test was completed twice with a one-week interval to assess the reliability of the questionnaire, which was 86 by Cronbach's alpha coefficient. Each exam had 50 questions, with the pre-test and post-test pair questions meant to evaluate the student's degree of learning at the knowledge level. The individual questions were at the comprehension, application, and analytical levels, and their reliability coefficient was calculated by calculating the correlation coefficients of the subjects' scores and their average semester, which were 85 and 80, respectively, for the pre-test and post-test. Teachers and experimental scientific education professionals utilized the test questions for validity since they were posed at the level of superficial and important learning.

5. Implementation method

To perform the study, one class was designated as a control group, while the other was designated as an experimental group. To begin, the textbooks were given to the experimental group's pupils in the form of instructional software, booklets, pamphlets, and specialized websites. After studying the students in the following session, with the teacher's supervision and efforts with the students, the essential parts of the lesson were described, the next topic was addressed with the consent of the appropriate secretary, and the lessons were delivered in a previous manner. This procedure might take up to eight weeks. Students were, of course, tested at the end of each session. The second set of participants was taught using a passive learning strategy as a control group. The groups were compared and examined once the pre-test and post-test findings were completed.

6. Findings

The following data pertains to the research hypotheses:

Table 1. The results of the analysis of covariance between experimental and control groups in deep learning scores

	Total squares	Degree of freedom	Mean squares	Variance	Significance level	Eta square
Groups	131.42	1	131.42	20.31	0.00001	0.23
Pretest	15.66	1	15.66	2.32	0.1	0

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Table 2. The mean and standard error of deep learning scores of experimental and control groups after controlling pre-test scores

Group	Mean	Standard deviation	0.095 confidence level	
			the lower limit	upper limit
Experiment	12.33	0.43	11.72	13.22
Control	8.92	0.44	8.33	10.43

The findings of the analysis of covariance in Table 1 demonstrate that there is a significant difference between the experimental and control groups' conceptual (deep) learning, with a p less than 0.01 and a variance of 20.33. The square is 1 to 0.023, implying that inverse classes account for 23% of the variation in the conceptual (deep) learning score. Table 2 shows that after controlling the variable, the mean deep learning score in the control and experimental groups is 12.33 the experimental group and 9.65 for the control group, which are statistically different from each other. In other words, classroom instruction has been successful in boosting students' deep learning.

Table 3. The results of the analysis of covariance between experimental and control groups in atomic learning scores (superficial)

	Total squares	Degree of freedom	Mean squares	Variance	Significance level	Eta square
Groups	62.38	1	62.38	14.44	0.00001	0.21
Pretest	114.54	1	114.54	32.26	0.0001	0.21

Table 4. The mean and standard error of atomic (superficial) learning scores in the experimental and control groups after controlling the pre-test scores

Group	Mean	Standard deviation	0.095 confidence level	
			the lower limit	upper limit
Experiment	13.63	0.33	12.30	14.44
Control	11.58	0.34	9.87	12.22

Table (3) shows that there is a significant difference between the experimental and control groups' atomic (superficial) learning scores, with a variance of 14.44 and a p-value of less than 0.01. The square is 1 to 0.21, indicating that movement class activities account for 21% of the variation in the atomic (superficial) learning score. According to Table (4), after controlling the same variable, the mean score of atomic learning in the experimental and control groups is 13.63 for the experimental group and 11.58 for the control group, a significant difference. In other words, backward classroom teaching has proven more effective than passive instruction in terms of atomic (superficial) learning.

7. Discussion, conclusions and suggestions

The mean of the two groups is statistically substantially different, according to the findings, and employing the backward class technique improves the quantity of atomic and deep learning. While expanding the time interval, interaction, and group activity, it appears that employing the backward class technique also enhances the breadth of creativity, thinking, and a general and in-depth view of the courses. Learners, on the other hand, study the offered information in order to master it. With parental oversight and competent administration, cyberspace and social networks offer a fantastic platform for group interactions. In David Azobel's meaningful learning approach, on the other hand, learning takes shape when the learner already has the concepts and background knowledge to connect current learning to past learning, and this process is simple to accomplish in the backward class technique. The results of the research are in line with those of Maleki (2015) and Mortazavi (2004), Ismailifar (2015) and Shimamoto (2012) and Ventry and Kilmer (2013). Based on the outcomes of the study, it is proposed that this strategy is more suited to encouraging greater levels of learning in challenging courses in high school. On the other hand, in the field of education, educational points in the educational space and the school intelligence plan should be highlighted so that instructors and educators are better than students in the field of science and research while presenting and overseeing academic matters.

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