

Effect of Cooperative Learning Strategies on Students' Critical Thinking Skills; Interpretation and Analysis at Higher Secondary Level

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Abstract

The study was conducted to find out the effect of cooperative learning strategies on students' skill of interpretation and analysis at the higher secondary level. The research was quantitative. A pre-test post-test control group design was adopted for the study. One female public sector higher secondary school of district Sargodha was the population of the study. 60 students of grade XI were selected as a sample by using a simple random sampling technique. Two groups were formed: experimental and control comprising thirty students each. The experimental group was taught by applying cooperative learning strategies; jigsaw and scripted cooperation, while the conventional method was used to teach the control group. The period of intervention was sixteen weeks and English book I for grade XI was selected as content for intervention. A self-made test was used to assess the skills of interpretation and analysis as pretest and posttest. Data of pretest and posttest were analyzed by applying paired sample t-test. Analysis of the data showed a significant difference between pretest and posttest scores of the experimental group. On the other hand, there was no significant improvement seen in the control group. Teachers were recommended to use cooperative learning strategies to develop the critical thinking skills of the students.

Keywords: Cooperative Learning, Jigsaw, Scripted Cooperation, Interpretation, Analysis, Higher Secondary Level

Introduction

Critical thinking is one of the 21st-century skills that is a desired learning outcome of education. The learners who have better critical thinking are expected to be better professionals as well as better individuals. To compete in the global world and to earn a better future, the education system must produce individuals with better critical thinking. Facione and Facione (2007) defines critical thinking as mental and cognitive abilities and skills which include interpretation, analysis, evaluation, inference, explanation, and self-regulation. Critical thinking enables individuals to think independently, evaluate the information accordingly, and make better judgments and decisions. Johnson et.al, (1998) is of the view, that when the learning task is complex and the goals of learning are of a higher level, such as creativity, problem-solving, higher-level reasoning, and critical thinking, then innovative teaching methods are required. Cooperative learning is one of those innovative teaching methods, which is found to be effective for the development of critical thinking (Johnson et.al., 1998; Rajab & Ibrahim, 2017).

Cooperative learning is structured group work to achieve common learning goals (Reza et al., 2013). The role of the instructor in cooperative learning is of facilitator. The main purpose of cooperative learning is the active involvement of the students in the learning process. It facilitates the learners with diverse learning needs (Altun, 2015; Phiwpong & Dennis, 2016; Rajab & Ibrahim, 2017). Learning takes place in a social setting. The underlying premise of cooperative learning is founded in constructivist epistemology, in which learners construct their knowledge (Almala, 2005). When students work in cooperative groups, their understanding of the content and ability of critical thinking improves (Rajab & Ibrahim, 2017; Schwieger et al., 2010). The theoretical foundations of cooperative learning are social interdependence theory, cognitive development theory, and motivational theory. These theories provide the foundation for the application of cooperative learning in the classroom. All of these emphasize the role of social interaction which is necessary for comprehension, reasoning, and critical thinking (Woolfolk-Hoy, 2005). Each of these theories

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complements each other to support the effectiveness of cooperative learning in the classroom (Tran, 2013).

The development of critical thinking is one of the competencies and students' learning outcomes mentioned in the National Curriculum of English for Grade I to XII 2006. But regrettably it is stated that the critical thinking of the majority of the Pakistani students is poor. Although the curriculum document suggests innovative teaching methods for its development, traditional teaching methods are practiced in the classroom (Hussain et al., 2013; Najmonnisa, & Haroon, 2014; Naseer et al., 2009). Traditional teaching methods focus on memorization of the content (Khan, & Inamullah, 2011; Ning & Hornby, 2014), and neglect the creativity and thinking abilities of the students. The existing classroom practices in Pakistan do not support cooperation and students' active involvement (Ning & Hornby, 2014; Sultana, & Zaki, 2015). Keeping in mind the current scenario, the researcher aimed to explore the effect of cooperative learning strategies on students' critical thinking skills at the higher secondary level. For this study, only skills of interpretation and analysis were selected.

Objectives of the study

The study was conducted to find out:

1. The effect of cooperative learning strategies on students' skill of interpretation at the higher secondary level.
2. The effect of cooperative learning strategies on students' skill of analysis at the higher secondary level.

Hypotheses of the Study

Following null hypotheses were formed to test in the study:

H₀₁: There is no statistically significant difference between experimental and control groups' mean scores of the skill of interpretation at the higher secondary level.

H₀₂: There is no statistically significant difference between experimental and control groups' mean scores of the skill of analysis at the higher secondary level.

Significance of the Study

The study is significant for teachers to use innovative teaching methods for the improvement of students' critical thinking skills. Teachers can be encouraged to adopt cooperative learning teaching strategies at the higher secondary level. The students of grade XI are the direct beneficiaries of this study. The Study is also helpful for curriculum developers to emphasize innovative teaching methods, specifically cooperative learning in the curriculum, to enable the students to be better critical thinkers at this level. The study is significant for teachers' training institutes to train prospective teachers to implement cooperative learning strategies in their classroom practice.

Review of literature

Cooperative Learning

Cooperative Learning is the instructional use of small groups so that students work together to maximize their own and each other's learning (Johnson and Johnson, 1999; Sharan, 1994; Slavin 2011). It is a learning method in which students are actively involved in their learning rather than passively sitting in the classroom to get knowledge (Liang, 2002). Learning takes place in groups that are of three types, namely informal cooperative learning groups, formal cooperative learning groups, and cooperative based groups (Johnson & Johnson, 2009). Informal cooperative learning groups are short-term which last from few minutes to one class period. Formal cooperative learning groups last for one class period to several weeks. Cooperative-based groups are long-term and last for one semester to the whole academic year. The purpose behind all the cooperative learning groups is to promote cooperation and to achieve common learning goals (Ballantine & Larres, 2007). Although groups are an integral part of cooperative learning, it is not simple group work in which students sit next to each other and work on their assigned tasks (Gillies, 2003), rather, in cooperative learning teachers have to ensure the subsequent five elements: Positive interdependence, Face-to-face (promotive) interaction, Individual and group accountability, interpersonal and social skills and Group processing (Jacobs & Hall, 2002; Johnson & Johnson, 2009; Sadeghi, 2012). These five elements make cooperative learning different from group work.

Positive interdependence: Striving for a common goal and caring about every individual's learning in the group is positive independence (Sharan, 1994). It occurs when individuals recognize that they can succeed only when other individuals in the group will also succeed (Johnson & Johnson, 2009) It can be established only when there are common goals, roles are assigned and the task is divided

equally and there is a collective reward (Johnson & Johnson, 2009; Tran & Lewis, 2012; Jensen et al., 2002).

Face-to-face (promotive) interaction: It occurs when learners are provided the opportunity to have face-to-face interaction. Learners behave responsibly and honestly, provide help and guidance to other group members where needed, provide feedback to each other for improvement, challenge each other's thinking, and explore different perspectives (Ballantine & Larres, 2007; Johnson & Johnson, 2009). Learners must be provided a comfortable environment, where they can interact comfortably (Slavin, 2011).

Individual and group accountability: Although all the learners work and learn in the form of a group, they perform individually and are responsible for their learning (Johnson & Johnson, 2000; Slavin, 2011). This element develops when each member accepts his/her responsibility and considers that his learning is essential (Tran & Lewis, 2012). Every team member has to contribute to the group and each one is responsible for his as well as his team's teaching (Johnson & Johnson, 2000). To develop this element in learning groups, three methods can be adopted: individual tests, a random selection of the group members for response to oral questions on behalf of their group, and providing the opportunity of presenting to students so that they can share what they have learned (Johnson et al., 1998).

Interpersonal and social skills: This element occurs when learners learn to work in a group that has diversity in knowledge as well as learning styles. If socially unskilled people form a group, the performance of the group cannot be effective (Johnson & Johnson, 2011). Social skills refer to group-related skills and task-related social skills. Group-related skills refer to the ability of students to interact with each other; appreciating, mediating disagreements, and praising. Task-related social skill refers how students interact with each other to achieve team objectives. This interaction requires asking questions, explaining, and summarizing the content. Learners must have different skills such as decision making, leadership, trust-building, and conflict management (Johnson & Johnson, 2009; Sadeghi, 2012). Explicit instruction is required to make students better in communication, leadership and conflict resolution skill, and team building (Wyk, 2012). These skills can be taught by applying strategies such as role-playing and modeling in the group (Slavin, 2011).

Group processing occurs when group members are enabled to evaluate group work; to decide which actions are required and which are unnecessary, which need to change, and which should be continued (Johnson & Johnson, 2009). Group processing helps in improving the effectiveness of group members through continuous reflection on their group performance (Yamarik, 2007).

If these elements are included in cooperative learning groups, the achievement of the students improves and they demonstrate better learning skills (Johnson & Johnson, 2011) and establish positive relationships among group members and between teacher and students (Slavin, 2011). In a cooperative learning classroom, learners get an opportunity to learn various social, cognitive, and thinking skills by doing several activities which maximize their interaction. Some common cooperative learning strategies are: Student teams' achievement division (STAD), Think-pair-share, Numbered heads together, Teams assisted individualization (TAI), Learning together, reciprocal questioning, Jigsaw, and Scripted cooperation (Johnson & Johnson, 2009).

Critical thinking's

Critical thinking is defined by different scholars differently. Definition of Ennis (2011) is one of the most eminent definitions of reasonable reflective thinking that is focused on deciding what to believe or do. According to Ryan and Tatum, (2013), critical thinking is the ability to select, analyze, and utilize information effectively. Reichenbach (2001) states that critical thinking is the ability to accept or reject any information based on thoughtful judgment. Despite multiple definitions of critical thinking, there is a consensus on what it involves (Pithers & Soden, 2000). Critical thinking is not just to get and retain information, rather it is continuous self-reflection (Facione, 1998). The definition of the panel of Delphi research report is considered the most comprehensive, according to which, critical thinking is the combination of six skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Interpretation is to comprehend ideas and to clarify meanings. The analysis is to examine ideas, identify and analyze arguments. Evaluation is to assess the claims and arguments. Inference refers to querying evidence and drawing conclusions. The explanation is to state and justify that reasoning. Self-regulation is to monitor oneself and to know what we know (Facione, 1998).

Cooperative learning and critical thinking

Although the concept of critical thinking is not directly measurable and teaching it is not easy, yet there is always a chance to enhance this skill through deliberate teaching (Moseley et al., 2016; Willingham, 2007). Learning experiences can develop and improve it (Loving & Wilson, 2000; Seymour et al. 2003). The teacher is responsible for its development (Choy & Cheah, 2009). Willingham (2007) stated that one of the basic purposes of education is to enable students to think critically, but this goal is incompetently met. As the 21st century is the age of information technology, critical thinking is a crucial requirement to select and evaluate the reliability of the information (Grabau, 2007). South-East Asian students are lacking the required skill as it is not commonly emphasized in schools (Djiwandono, 2013; Egege & Kutieleh, 2004).

Cooperative learning activities have been used to develop the critical thinking skills of the learners for years (Sharan, 1994). Literature suggests cooperative learning very fruitful for developing not only students' social skills, language acquisition, academic achievement but for fostering critical thinking skills (Ghaith, 2003; Johnson et al., 1998; Sadeghi, 2012). Students who learn through cooperative learning have a chance to develop their thinking (Booyesen, & Grosser, 2014; Johnson & Johnson, 2017). Students' face-to-face interaction promotes critical thinking (Fahim & Eslamdoost, 2014; Ten Dam & Volman, 2004). Group discussions are effective in stimulating and developing ideas which is the first requirement of critical thinking (Devi et al., 2015). Critical thinking of the students can be enhanced through cooperative learning, as in cooperative learning students have a chance of group discussion, evaluating and synthesizing the information, evaluating the solution as students are responsible for their learning (Garcha, & Kumar, 2015). Cooperative learning promotes interaction among students which helps develop critical thinking (Castle, 2014; Devi et al., 2015).

Research Methodology***Nature and Design of the Study***

The study was aimed to find out the effect of cooperative learning strategies in the development of critical thinking. The study was based on a quantitative research approach (post-positivist paradigm). The experimental research design was considered the most appropriate for this study. Pre-test post-test control group design, one of the true experimental designs was selected for the study. This design is very rigorous as all the threats to internal and external validity are controlled in this design. This design requires at least two groups: experimental and control, which were formed through the random assignment in this study. There was one independent variable (cooperative learning) and one dependent variable (critical thinking) in the study. The experimental group was given treatment which was the use of cooperative learning strategies in the classroom to develop the critical thinking of the students. While the control group was taught by using traditional teaching methods. Critical thinking is the combination of different skills such as interpretation, analysis, evaluation, inference, explanation, and self-regulated learning. Only two skills; interpretation and analysis were selected for this study. There are several strategies of cooperative learning but only two strategies; Jigsaw and scripted cooperation were applied for this study.

Sample of the Study

One female public sector higher secondary school of district Sargodha was selected conveniently. A random sampling technique was used to select sixty students of grade XI as a sample. Two equal groups were formed; control and experimental comprising thirty students each through random assignment. The Control group was taught English through the conventional teaching method, while, the experimental group was taught the same content by applying cooperative learning strategies. There are many strategies available in the literature, but for this study, only two strategies; jigsaw and scripted cooperation were selected according to the content and objectives of the study.

Instrumentation

A test was developed by the researcher having eleven (11) multiple-choice questions. Six questions were developed to measure the skill of interpretation and five were for the skill of analysis. Validity of the test was ensured through five experts who have expertise in research as well as the teaching of the English language. The reliability of the test was ensured by pilot testing. Cronbach's alpha reliability was .909. The level of significance was set at 0.05 level. This test was used for pre-test and post-test.

Collection of Data

Data were collected by conducting Pre-test and post-test. The pre-test was conducted to both experimental and control groups and then intervention started. The intervention period has consisted of 16 weeks, one 45 minutes six days a week. Lessons of the selected content; English Textbook-I for students of grade XI, was planned by applying cooperative learning strategies. Small groups of the students were formed of the experimental group to employ cooperative learning. The teacher played the role of the facilitator. Students were guided by the researcher about cooperative learning and its role in its implementation. The students of the control group were taught the same content, without using cooperative learning strategies. That group was taught by using traditional teaching methods: grammar-translation method and lecture method. After completion of the intervention period, a post-test was conducted on both groups. Data were analyzed through paired sample t-test. Mean scores of pre-test and post-test of both the groups were compared. These mean scores helped the researcher to find out the difference between their levels of critical thinking.

Data Analysis and Results

Null hypotheses were developed to find out the effect of cooperative learning strategies on students' critical thinking skills; interpretation and analysis. The detailed data analysis with interpretation is presented as under:

H_{01} : There is no statistically significant difference between experimental and control groups' mean scores of interpretation at the higher secondary level.

Table 1: Comparison of mean scores of skill of interpretation

	Mean	SD	t	DF	sig. (2-tailed)
Experimental Group post-test	6.70	1.664	11.275	29	.000
Experimental Group pre-test	3.67	1.470			
Control Group post-test	3.80	1.095	1.153	29	.258
Control Group pre-test	3.63	1.450			

Note: $p = 0.05$ and $n = 30$

Results of table 1 indicated the comparison of skill of interpretation based on pre-test and post-test results. According to the study results, experimental group performed better in post-test (mean = 6.70, SD = 1.664) regarding interpretation skill whereas pre-test results were (mean = 3.67, SD = 1.470). This difference was found to be statistically significant, $t(29) = 11.275$, $p = .000$ which was less than the predetermined p -value of 0.05. The difference was due to the intervention of cooperative learning activities.

On the other hand, table 1 showed the control group results for interpretation skills. Results showed that control group post-test results showed minor improvement in interpretation skill as (mean = 3.80, SD = 1.095), pre-test results were (mean = 3.63, SD = 1.450). The results showed that the difference is statistically insignificant as $t(29) = 1.153$, $p = 0.258$ which was greater than the predetermined p -value of 0.05. The minor improvement which is seen maybe by chance.

The results of the study failed to support the null hypothesis H_{01} : There is no statistically significant difference between experimental and control groups' mean scores of interpretation at the higher secondary level. Results showed a significant difference between the experimental and control group's mean scores on post-test. The mean score of the experimental group in the post-test is greater than the mean score of the control group which shows that the experimental group performed significantly better in the post-test than the control group.

H_{02} : There is no statistically significant difference between experimental and control groups' mean scores of analysis at the higher secondary level.

Table 2: Comparison of mean scores of skill of analysis

	Mean	SD	t	DF	sig. (2-tailed)
Experimental Group post-test	4.70	.877	14.000	29	.000
Experimental Group pre-test	2.83	.531			
Control Group post-test	2.90	.548	1.795	29	.083
Control Group pre-test	2.80	.610			

Note: $p = 0.05$ and $n = 30$

Results of table 2 indicated the comparison of skill of analysis based on pre-test and post-test results. According to the study results, experimental group performed better in post-test (mean = 4.70, SD = .877) regarding skill of analysis as compared to the results of pre-test (mean = 2.83, SD = .531). This difference was found to be statistically significant, $t(29) = 14.000$, $p = .000$ which was less than

the predetermined p-value of 0.05. The difference was due to the intervention of cooperative learning activities.

On the other hand, table 2 showed control group results for the skill of analysis. Results showed that control group post-test results showed minor improvement in analysis skill as (mean = 2.90, SD = .548), pre-test results were (mean = 2.80, SD = .610). The results of the study showed that the difference is statistically insignificant as $t(29) = 1.795$, $p = .083$ which was greater than the predetermined p-value of 0.05. The minor improvement which is seen maybe by chance.

The results of the study failed to support the null hypothesis H_{02} : There is no statistically significant difference between experimental and control groups' mean scores of analysis at the higher secondary level. Results showed a significant difference between experimental and control groups' mean scores on post-test. The mean score of the experimental group in the post-test is greater than the mean score of a control group which shows that the experimental group performed significantly better in the post-test than the control group.

Findings

This study was conducted to find out the effect of cooperative learning strategies on students' critical thinking skills; interpretation and analysis. Two strategies of cooperative learning; jigsaw and scripted cooperation were selected to teach English textbook 1 for grade XI. Data analysis revealed some findings which are as under:

1. The mean score of the experimental group on post-test for the skill of interpretation was 6.70 which was significantly greater than the mean score of the control group on post-test which was 3.80. This difference in mean scores revealed that cooperative learning strategies were found effective in developing students' skill of interpretation at the higher secondary level.
2. The mean score of the experimental group on post-test for the skill of analysis was 4.70 which was significantly greater than the mean score of the control group on post-test which was 2.90. This difference in mean scores revealed that cooperative learning strategies were found effective in developing students' skills of analysis at the higher secondary level.

Conclusion

The results and findings of the study revealed that cooperative learning strategies were effective for the development of critical thinking of the students at the higher secondary level. These strategies were applied in the classroom for the experimental group, by aiming to develop the skills of interpretation and analysis. The results of the study showed that both of the skills of the students of the experimental group improved as compared to the control group. So, it was concluded that cooperative learning strategies were effective for the development of critical thinking of the students at higher secondary level in general and the development of the skills of interpretation and analysis in particular.

Discussion

The study was conducted to find out the effect of cooperative learning strategies in the development of critical thinking. Critical thinking is one of the 21st-century skills and is considered important to become better individuals and successful professionals. Cooperative learning has been used to develop the critical thinking of the students for years (Johnson et.al, 2000). A review of the literature suggested it an effective method for the development of critical thinking. But in Pakistan, the critical thinking of the students is not well developed. The reason behind this is our system of education in general and methods of teaching in particular. Teachers avoid using innovative teaching methods which are considered supportive to develop the thinking skills of the students. By using traditional methods in the classroom, teachers encourage students to be passive listeners and accept the dominance of the teacher. The current study was conducted to find out the effect of cooperative learning in the development of critical thinking in the Pakistani context. The study was experimental. Cooperative learning strategies were manipulated to develop the critical thinking of the students of the experimental group. The findings of the study revealed that cooperative learning strategies were significantly effective for the development of critical thinking of the students at the higher secondary level. The findings of the study are consistent with the findings of (Garcha & Kumar, 2015) who conducted a study on prospective teachers and applied Jigsaw to develop critical thinking. The findings revealed that cooperative learning facilitates students in developing their critical thinking.

Cooperative learning strategies promote interaction among students which is the basic requirement of critical thinking. This interaction helped the students of this study to become better

critical thinkers. Devi et al., (2015) conducted a study in Indonesia in a vocational school and implemented three cooperative learning strategies: jigsaw, think-pair-share, and structured controversy. The researchers found cooperative learning helpful in promoting interaction and resultantly developing critical thinking among students.

The findings of the current study showed significant improvement in the level of critical thinking of the students who were taught through cooperative learning. Ghaith (2003) and Sadeghi (2012) also recommended cooperative learning strategies to foster the critical thinking of the students.

The findings of the current study were also consistent with the findings of (Fahim & Eslamdoost, 2014; Johnson et al., 1998; Ten Dam & Volman, 2004) who declared cooperative learning as an effective strategy for the development of critical thinking.

The higher secondary level is considered very significant in Pakistan because after completing this level of education, students either leave their education or join the labor market or they opt for higher education. To be successful in the workplace as well as in higher education, critical thinking is the basic requirement. Therefore, the curriculum document stated it as a major learning outcome at the higher secondary level. The national curriculum of English language for grade I-XII, 2006 recommends cooperative learning as the most suitable teaching method to develop critical thinking of the students (Govt. of Pakistan, 2006). The findings of the current study validated its effectiveness for the development of critical thinking at the higher secondary level.

Recommendations

The following recommendations have been made based on the findings of the study:

1. Curriculum developers may incorporate cooperative learning strategies more explicitly in the document of National Curriculum, and emphasize its implementation in the classrooms.
2. Teachers' training institutes may devise training programs to enable prospective teachers to incorporate cooperative learning strategies in their classrooms.
3. Heads of the institutes may encourage teachers to apply cooperative learning strategies in their classroom practice.
4. Teachers teaching at different levels may adopt cooperative learning strategies for teaching different subjects which may help them in enabling the students to think critically.

Recommendations for Future Researchers

1. Only two sub-skills of critical thinking were selected to be analyzed in this study. It is recommended for future researchers to conduct studies to find out the effect of cooperative learning in the development of remaining sub-skills of critical thinking through their researches.
2. Only two strategies of cooperative learning were applied and tested in this study. Future researchers may conduct studies to find out the effect of other cooperative learning strategies in the development of critical thinking.

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