

# Impact Of Collaborative Inquiry Method On Students' Learning Motivation In Classroom

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## Abstract

The purpose of this study was to compare the impacts of studying science using a collaborative inquiry learning approach with and lecture method, as well as to examine the effects of these methods on the learning motivation of secondary school students. On the basis of a pre-test of learning motivation, students at the target class were separated into two equal groups: control and experimental. For eight weeks, the experimental group was taught using a group inquiry learning technique, whereas the control group was taught using a traditional technique. After treatment, a post-test of learning motivation for science was given to see if there was any difference in performance between the two groups. The data were organized and analyzed for obtaining mean, standard deviation and t-values. The treatment group's score on a post-test of learning motivation for science was much better than the control group. This demonstrates that collaborative inquiry method is more effective for science learning than lecture method.

**Keywords:** Collaborative Inquiry Method, Students, Motivation, Science

## Introduction

Secondary school is an important part of a student's life. The academic careers of students have different fields and science is the prominent. In which, biology is particularly difficult to teach and understand because to its terminology and practical nature for teachers and students. By initiating inquiry activities and training students on biological topics, teachers can positively develop students' competencies in the subject. Although collaborative learning has been hailed as a fruitful technique to boost students' learning, continuing learned material, rational thinking, and motivation, Bransford et al. (2000) claim that social relations can influence the learning experience directly. A lecture-based educational technique does not properly evaluate students' knowledge. The teacher frequently continues his or her monologue and rarely allows students to participate orally during the lesson. The course material is often provided in an incorrect and unlabeled manner through lecture, students have difficulties determining the most important element of the lecture for examinations.

Bell et al. (2010) explained inquiry learning is aimed at making some fresh but creative norm for educational activities in the classroom so that the students in groups remain busy to adopt academic task under the guidance of their teacher. It is predicted that this mode of acquiring education improves students' urge and curiosity in scientific manner to learn and adopt step of investigation like scientists and are able to attain learning on scientific bases (Bell et al., 2005). In consequence to group investigation learning, students are motivated to get knowledge about how to learn science as a common practice. Their focus is on the nature of science and the scientific material. Slavin (1996) defines motivation is an internal process that activates and retains behavior over time.

One feasible approach of teachers is to improve teaching learning methodologies, which helps to overcome these challenges in science classes. Scientists and academics have frequently expressed worries about the advancement of permitting conditions for effective learning. Vygotsky and Cole (1978) emphasized on a social component in the classroom when learners do tasks with in a group. Kolb (1984) stated retrospective reflection, while Black and William (1998, 2009) emphasized inquiry learning. The Inquiry-Based Teaching (IBT) method is used to explain empirical inquiry-based teaching techniques (Kahn & O'Rourke, 2005). The method is founded on constructivism teaching methods. It is student-focused, instead of teacher-centered, and allows pupils to participate actively in discovering, questioning, and studying. Because it piques students' curiosity in logical knowledge and abilities, the technique has been deemed capable of increasing motivation of students (Gibson & Chase, 2002). Inquiry-Based Teaching (IBT) appears to be particularly effective in encouraging student accomplishment, motivation, and rational thinking to study science, as well as improving scientific abilities (Sola & Ojo, 2007; Khan & Iqbal, 2011).

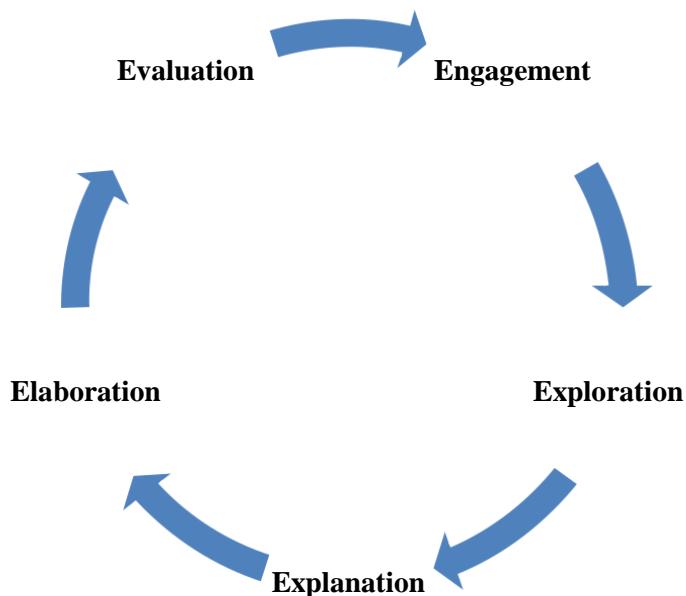
Academic motivation refers to students' desire to find relevant and important academic activities and to attempt to get the desired academic benefits from schooling (Dowson & McInerney, 2001). High educational motivation has long been linked to higher levels of educational success among pupils (Kushman et al., 2001). As a result, improving student motivation in Pakistani high schools is an important goal for science teachers. Science study is an important component of both formal and informal education for children. In order to overcome common difficulties, students engage in rational thinking and assessment. This empirical solution to address everyday problems has to be encouraged and strengthened in a classroom setting, where instructors can frequently alter and develop curriculum to match the needs of their students (Poon et al., 2009). The school, in which the student spends the most of the time, is the finest place for fostering and promoting systematic rational thinking. Formal education takes place in the school setting. The instructor, who is specifically qualified to educate at specific levels, transforms the child's beliefs and ideals. Effective teachers and scholars have conducted research that suggests assertions and provides evidence in favor of both the empirical approach and the traditional instructional approach of science teaching.

Conventional teaching is the most popular mode of instruction in Pakistani scientific classrooms. According to Safdar (2013) students are needed to absorb knowledge and skills in science courses

and recreate it in the assessment. Consequently, pupils lack the intrinsic ability to construct their own reasoning concerning scientific phenomena, as well as the ability to connect disparate ideas to explain scientific events. While inquiry-based study is about understanding and applying scientific concepts and techniques, not merely rote learning of information, this leads to a contempt for systematic method and interest in learning science (Bell et al., 2010).

Therefore, in Pakistani context, it seems reasonable to introduce and try out the productiveness continuous methods of teaching-learning like collaborative group inquiry for teaching science subjects. The pattern which we follow after exploring the present study, it has been found suitable to introduce is based on the 5E. The Biological Science Curriculum Study (BSCS) designed the 5E approach, which is a practical methodology of teaching by enquiry. This was develop on a constructivist learning paradigm. Each E stands for a step in the studying process that aims to assist students improve knowledge and experience. Engagement, Exploration, Elaboration, and Evaluation are the elements of the 5E model. According to Bybee et al. (2006), the 5 phases of the paradigm have the following general goals and activities.

**Figure 1: 5 E Learning Cycling Model by Bybee (2002)**



The teacher primarily asks intriguing, motivating, and enthusiastic questions just to recall previous lecture in order to keep the students attentive and engaged intellectually. At this point, the teacher is less concerned with the correct answer and more concerned with previous knowledge of the issue and the pupils' desire to learn more knowledge. This aids in reinforcing students' focus on the facts, which are the source of true knowledge and immediately affect the rational component of the intellect. This method engages students' minds in order to motivate their physically and psychologically abilities (BSCS, 2006). Students are able to comprehend multiple sections of the

learning throughout the exploration process, and they now have the skills to answer the question individually, having synthesis ability in the current circumstance. The learners become immersed in a constructive interchange of ideas and are now capable of accepting pertinent content while relegating unnecessary elements to the back. The teacher's function in this setting is a facilitator (Llewellyn, 2002).

The students' participation concentrates on the learning experience and is more effective. This tends to make the difficult learning process much easier because the students discuss, connect, and summarize in view of their exploring, making the learning actually associated to their previous accomplishments and current achievements through their specific and active participation (Bybee, 2002). In the development stage, the teacher examines and expands on the student's understanding of scientific techniques. They have a full understanding as a result of their own experiences, and they also employ sufficient scientific and problem-solving approaches. They go on to do more tasks and put their scientific knowledge to use. They continue to gain concepts until they are able to surpass newly notions with previously acquired concepts.

At the end of the process, the teacher joins as well as the combined efforts of students and teachers result in meaningful learning through a simple techniques (Bybee, 2002). The assessment of the pupils in the subject they have learnt is probably the end of the experimental method. Evaluation is the final phase in the inquiry teaching method. The teacher hypothesizes and assesses the students' knowledge of the present topic. This type of assessment is centered on the learning or educational goals. The teacher can use both official and informal assessments. This form of assessment is associated to logical research and knowledge application in the conduct of scientific studies (BSCS, 2006). The BSCS 5E inquiry model plays a significant role in laying out, expanding, and effectively presenting the curriculum's material (Bybee et al., 2006). Inquiry-based learning has been proposed as a strategy for motivating pupils to develop an interest in learning new skills and knowledge (Gibson & Chase, 2002).

### **Significance**

In the scientific class, cooperative inquiry education is thought to have a wide range of outcomes. Moreover, due to the culture in Pakistan, few studies have been conducted to determine that collaborative learning is effective in increasing students' willingness to learn Biology when compared to traditional lecture methods. Generally speaking, the findings of this study may be effective in designing biology learning more enjoyable for teachers, students, and institutes, decision makers, curriculum designers, science institutions, projects, and text book boards in Pakistan; urging teacher trainers to incorporate the findings into their training courses; and provides recommendations for further studies.

### **Objective**

A pre-requisite has been deemed necessary to improve the quality of learning, particularly in the sciences. It can be achieved by implementing rapid changes in scientific curricula's courses and approach. The purpose of this study was to compare the effects of collaborative inquiry learning with lecture learning in Grade 9 biology classes. The study was about to look at the impact of collaborative inquiry on biology students' motivation to learn in secondary school.

### **Hypothesis**

The study's premise was that there was no significant difference in learning motivation pre- and post-test mean scores of students taught biology using a collaborative inquiry approach versus students taught using a typical traditional method at the secondary school.

### **Methodology**

The study employed a collaborative inquiry learning strategy to develop students' motivation in biology. A pre-test, post-test equivalent group design was used to examine the impact of the collaborative inquiry-based learning strategy in developing motivation. The population of the study was comprised of all students of Tameer-i- Nau Public School Mansehra who were studying biology at the secondary level. The sample of the study consisted of 80 ninth-grade students who were enrolled in biology. A learning motivation measure was designed after studying literature and interviewing professionals to obtain data from students about their learning motivation. Experts gave their opinion on developed scale. There were 40 items in each section of the scale. The students' learning motivation data were obtained for future analysis. The t-test was used to compare the effectiveness of collaborative inquiry learning vs traditional method in developing learning motivation.

The study followed the Pre and Post-test equal group. This approach is more useful in comparison, it eliminates the improper causes of variance (Gay et al., 2009). Students were divided into treatment and control groups based on their mean score on a pre-test of critical reasoning and a pre-test of motivation for Biology. A learning motivational scale was designed and administered as a pre and post-test on the characteristics of learning motivation for 9th grade biology students. A five-point likert scale with 40 items was selected to collect data on learning motivation. This scale comprised learning motivation elements depending on the relevant specifications: 'Self-efficacy' in Biology were 6, 'Active learning strategies' were 5, 'Science learning value' of Biology were 5, 'Achievement goal' in Biology were 5, 'Learning environment stimulation' were 5, 'Intrinsic motivation and personal relevance' in Biology were 8 and 'Self-determination in Biology' were 6. This specification has been assisted by Reid and Skryabina (2002).

### **Results and Discussion**

The purpose of this section is to discuss data analysis and interpretation. The test and control groups' data were analyzed using the t-test. Tables 1 and 2 show the findings of a study comparing the collaborative inquiry learning approach to traditional lecture methods in terms of learning

motivation. The variables of pre and post-test scores based on a self-rating scale were compared between the control and experimental groups using SPSS.

**Table 1 Comparison between Mean Scores of Experimental and Control Group on Pre-Test of Motivation towards Biology**

| Factors                                     | Groups | N  | M      | SD    | t-value | p    |
|---|--------|----|--------|-------|---------|------|
| Self-efficacy                               | E.G    | 40 | 23.27  | 2.13  | 1.49    | .139 |
|   | C.G    | 40 | 22.50  | 2.49  |         |      |
| Science learning value                      | E.G    | 40 | 19.62  | 2.23  | 1.78    | .078 |
|   | C.G    | 40 | 20.42  | 1.73  |         |      |
| Achievement goals                           | E.G    | 40 | 20.80  | 2.30  | 0.36    | .717 |
|   | C.G    | 40 | 20.60  | 2.60  |         |      |
| Intrinsic motivation and Personal relevance | E.G    | 40 | 29.70  | 2.76  | 1.07    | .286 |
|   | C.G    | 40 | 28.82  | 4.34  |         |      |
| Self-determination                          | E.G    | 40 | 23.22  | 2.95  | 1.30    | .195 |
|   | C.G    | 40 | 22.73  | 2.85  |         |      |
| Overall motivational score                  | E.G    | 40 | 154.92 | 9.9   | 1.27    | .206 |
|   | C.G    | 40 | 151.70 | 12.48 |         |      |

p>.05

Table 1 demonstrates that the experimental group's total mean motivation score is (154.92), whereas the control group is (151.70), with a p>0.05. As a result, there is no significant difference in the mean motivation score for Biology between the experimental and control groups. Self-efficacy (.139), science learning value (.078), accomplishment goals (.717), internal motivation and relevancy (.286), and self-determination (.195) were all estimated t-values that were higher at the .05 level. This indicated that there was no significant difference in self-efficacy, science learning value, accomplishment targets, internal motivation and personal relevance, and self-determination between the treatment and control groups of learning motivation at the pre-test. It was observed that there was no significant difference in the development of motivation between both groups' mean scores.

**Table 2 Comparison between Mean Scores of Experimental and Control Group on Post-Test of Motivation towards Biology**

| Factors                | Groups | N  | M     | SD   | t-value | P    |
|------------------------|--------|----|-------|------|---------|------|
| Self-efficacy          | E.G    | 40 | 24.22 | 2.67 | 2.43    | .017 |
|                        | C.G    | 40 | 22.50 | 2.75 |         |      |
| Science learning value | E.G    | 40 | 20.42 | 2.29 | 3.08    | .003 |
|                        | C.G    | 40 | 18.85 | 2.33 |         |      |

|  |     |    |        |       |      |      |
|--|-----|----|--------|-------|------|------|
| Achievement goals                              | E.G | 40 | 21.75  | 2.08  | 6.30 | .000 |
|  | C.G | 40 | 18.62  | 2.33  |      |      |
| Intrinsic motivation and<br>Personal relevance | E.G | 40 | 31.92  | 3.73  | 3.04 | .003 |
|  | C.G | 40 | 29.22  | 4.30  |      |      |
| Self-determination                             | E.G | 40 | 24.80  | 3.27  | 3.64 | .000 |
|  | C.G | 40 | 22.12  | 3.29  |      |      |
| Overall motivational<br>score                  | E.G | 40 | 161.42 | 12.85 | 4.11 | .000 |
|  | C.G | 40 | 149.10 | 13.92 |      |      |

p<0.05

Table 2 presents that mean motivation score of experimental group is (161.42) whereas of control group is (149.10) and  $p < 0.05$ . As a result, there is a substantial difference in the mean score for Biology between the test and control groups. As a result, the null hypothesis is rejected. The calculated t-values of various components of learning motivation like self-efficacy (.017), science learning value (.003), achievement goals (.000), intrinsic motivation and personal relevance (.003), self-determination (.000) were less than the tabulated value at 0.05 level. This indicates that there was a significant difference in self-efficacy, science learning value, accomplishment goals, internal motivation, personal relevance, and self-determination between the treatment and control groups after the post-test. The results of the data analysis indicated a highly significant difference in the development of motivation between the two groups, with the experimental group's mean score much higher than the control group's mean score. As a result of the treatment, the experimental group outperforms the control group. The study findings of Carin et al. (2001) Gibson and Chase, (2002), Khan and Iqbal (2011) and Njoroge et al. (2014) all confirmed the findings of this study.

## Conclusion

The findings of the study confirm that learning biology through collaborative group inquiry learning method develops huge inspiration among students at secondary level. This inquiry learning method with six different aspects of self-efficacy makes students able to bring about a desired result for learning motivation towards biology. Active participation of students in group inquiry learning method is proved to be more useful for obtaining the goals with five different aspects for learning motivation towards biology. The science learning value with five different features by group inquiry learning method enables students to handle various problems within short time for learning motivation towards biology. The result of research study shows that intrinsic motivation and personal relevance with eight different prospects by group inquiry learning method is much useful to appreciate students for using biological terminologies in valid and proper situations for learning motivation towards biology.

The collaborative inquiry learning method with six different characteristics of self-determination is important to achieve the solution of diverse problems by collecting data, observing and analyzing to reach the conclusion. According to the results of the data analysis,

there was a favourable change in the perception of learning motivation development as a result of encounters with the collaborative inquiry learning approach. Significant findings on learning motivation and its components, such as self-efficacy, science learning value, achievement goals, intrinsic motivation and personal relevance, and self-determination, demonstrated that learning motivation could be developed in secondary students using both collaborative inquiry and traditional methods, but group learning being more effective.

### **Recommendations**

Following are the recommendations for improving the learning process.

1. Developing motivation among students to learn Biology through group inquiry learning enhances academic achievements. Therefore, Biology teacher at secondary school level should adopt group inquiry learning method for enhancing motivation among students.
2. The group inquiry learning method with its factor like self-efficacy having six different prospects plays a significant role in arousing interest among students and also developing their involvement to learn Biology.
3. The collaborative inquiry learning method with its element like science learning value containing five different aspects encourages students to fulfill their task within due time. It is recommended that essential teachers' training must be provided to Biology teacher for effective implementation.
4. In instructional process for achievement of Biology teaching objectives, the importance of collaborative group inquiry learning method can't be denied. Hence it is recommended that must be made a part of curriculum document.
5. The outcome of the research study shows that the group inquiry learning method with its factor like intrinsic motivation and personal relevance comprising eight different aspects also plays a vital role for encouraging students by using biological technologies. Hence it recommended that the school Biology laboratory must be equipped with latest equipment helpful in implementing group inquiry learning method.
6. This inquiry learning method with its component like self-determination having six various aspects helps a lot in solving various issues by gathering information, observing and analyzing the data to reach the conclusion. It is strongly recommended that school library must be enriched with sufficient literature and books on collaborative inquiry learning method.
7. As it is an innovative approach, hence it is recommended that Biology teachers' network may be established to discuss various issues faced during teaching Biology to find out the solution. To make easy access to fresh knowledge about group inquiry learning method for teachers and students, it is recommended that internet connection must be made available in the school.
8. In comparison to conventional way of teaching, this study shows that collaborative learning is a more successful teaching technique of biology for developing



interest and motivation. Combining the collaborative learning approach with the activity method can make it more successful. As a result, science instructors of schools are encouraged to use the inquiry method while teaching.

9. Inquiry teaching methodologies should be used to train and equip science teachers on a modern and psychological basis, with an emphasis on the process of creating motivation among students. Lesson plans using the inquiry learning technique must be developed by biology teachers with an attention on the development of student motivation.

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