

EFFECT OF COLLABORATIVE LEARNING ON STUDENTS' ACADEMIC ACHIEVEMENT, ACADEMIC STRESS AND SOCIAL COMPETENCE IN BOKARO STEEL CITY

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ABSTRACT

"This has been extensively researched and promoted throughout the professional literature that concept of collaborative learning is very vital to achieve academic goals with group of subjects"⁴. The word "collaborative learning refers to an education method in which subjects at numerous performance levels work together in small groups to achieve a mutual goal". Subjects are accountable for their own learning as well each another's. Therefore, the accomplishment of one subject can help other subjects to be fruitful. In recent years, secondary schools have implemented more and more computer rooms as well as multimedia- learning classrooms to provide an instrument information technology education. "Subjects work independently on computer- constructed instructional trainings for one or more periods. This learning environment might fit well for instructions personalized to individual needs, but it can also create multiple problems such as hostility, increasing anxiety and dullness when subjects use machines"⁵. Subjects get secluded from each another in the sitting arrangement i.e. facing towards computer, subjects are discouraged from sharing material or backing to and by other subjects. "Social-Competence is an important ingredient of modern civilization: and is the essential attainment of the members of a progressive onward moving society"⁶. "Social-Competence is the condition of possessing the social, emotional and intellectual skills and behaviors needed to succeed as a member of society"

RATIONALE OF THE STUDY

Personality of an individual is developed by three domains of education i.e. cognitive, affective and psychomotor. It is conjointly true that individual might not have inborn ability to perform the given task with efficiency thence all ways of instruction don't align with learning capacities of each individual learner. Teachers depend on group instruction in which subjects experience problems in understanding the concepts and projects. At high school stage, emotional and social pressure is increasing day by day. Subjects do not have the capacity and training to solve their problems which they face in their daily life. Children are

frequently pressurized by their parents and educational institutions to excel in academics and other areas of performance.

Collaborative learning's effect on students' achievement and attitude has been a topic of study since last few decades. It has been found that "collaborative learning" can motivate subjects for bigger achievements, boost positive approaches and creative mind set. Most of the studies have proven a substantial increase in subjects' attainment level participating in cooperative-learning groups. Academic achievement is a multidimensional and multi-layered process. Learning outcomes are major responsibilities for all institutions to promote pedagogic growth of the children. This whole education system revolves around subjects' academic accomplishment.

Intellect, character, inspiration, school & home environment, inheritance, family background and learning are major factors which affect academic stress. But evaluation for academic achievement assessment is majorly limited to information, facts and understanding. One of the serious problems faced by educationists, teachers, parents and administrators is failure and poor achievement. Reason for the same is still need to be found. Various reasons can be high anxiety level, lacking emotional and social maturity or low general mental ability. These are some questions and answers that will make this study worthwhile. According to a review of-research in the field of small groups, there are collaborative educational and social advantages. The proposed research in the field of collaborative learning will help in progression of facts on the operational end.

Social-Competency is expounded to high school readiness that truly goes on the far side fostering attainment and acquisition skills and comprises developing the communal-expressive skills for co-operating with others thus creating and supporting positive dealings with lecturers and companions. Providing youngsters with backing for college keenness is vital to their future growth. Several researches recommended that social competency has vital relationship with performance. A longitudinal study conducted⁵³ extracted that social skills of 3rd and 4th class subjects were prognostic of each current and future tutorial performance. Suggestively, the social skills uninherited at young age were associated with their social skills and tutorial performance throughout their faculty years. Analysis has conjointly shown that "children's emotional, social and behavioral adjustment is as important to high school success as psychological feature and tutorial readiness. It conjointly emerged from a study that children's social and behavioral adjustment was as necessary as psychological feature and tutorial readiness". High social competency causes high performance and low social competency ends up in low performance. So, 'collaborative learning plays a major role in academic achievement, academic stress and social competency of the subjects.' Hence, the investigator can create humble decide to study these factors of secondary subjects.

PROBLEM STATEMENT

“EFFECT OF COLLABORATIVE LEARNING ON STUDENTS' ACADEMIC ACHIEVEMENT, ACADEMIC STRESS AND SOCIAL COMPETENCE IN BOKARO STEEL CITY”.

KEY DEFINITIONS

(i) Collaborative Learning

The term "collaborative learning refers to a teaching method in which subjects at different performance ranks work collectively in small groups toward a common aim. The subjects are accountable for their own learning as well as one another's”.

(ii) Academic Achievement

"Knowledge achieved or aids developed in the school are usually calculated by test scores or marks provided by teachers or sometime using both"⁵⁴. Thus, achievement in context of this study can be defined as “academic performance of subjects in English Grammar taught through collaborative learning. This can be measured with the help of achievement tests designed and developed by the investigator”.

(iii) Academic Stress

“Phenomenon occurring when academic demands on subjects exceeds his/her adjusted resources which leads to conflict and frustration thus causing psychological and physiological harm to the subject”.

(iv) Social competence

“Social-Competence is the ability to identify, understand and react appropriately in social situations”. This has been well-defined as “the social ability and interpersonal skill of an individual in a person-state interaction' or successfully handling the environmental factors”⁵⁵.

OBJECTIVES OF THE STUDY

(i) To compare the Academic achievement of subjects in English Grammar adjusted on intelligence and socio-economic status, instructed through collaborative learning and conventional method before the experimental treatment.

(ii) To compare the Academic achievement of subjects in English adjusted on intelligence and socio-economic status, instructed through collaborative learning and through conventional method, after the experimental treatment. To compare the mean gain Academic achievement scores of the experimental and control groups of subjects instructed English Grammar through collaborative learning and conventional method.

(iii) To compare the academic stress of subjects adjusted intelligence and socioeconomic status instructed through collaborative learning and through conventional method before the experimental treatment.

(iv) To compare the academic stress of subjects adjusted on intelligence and socio-economic status instructed through collaborative learning and through conventional method, after experimental treatment.

- (v) To compare the mean gain academic stress scores of the experimental and control groups of subjects instructed through collaborative learning and conventional method.
- (vi) To compare the social-competence of subjects adjusted intelligence and socio economic status instructed through collaborative learning and conventional method before the experimental treatment.
- (vii) To compare the social competence of subjects adjusted on intelligence and socio-economic status instructed through collaborative learning and through conventional method, after experimental treatment.
- (viii) To compare the mean gain social competence scores of the experimental and control groups of subjects instructed through collaborative learning and conventional method.

HYPOTHESES OF THE STUDY

Subsequent hypotheses were framed to grasp the goals of investigation

Ho-1 There is no significant difference between English Grammar achievement scores of control group instructed through conventional teaching method (CTM) and experimental group instructed through Problem-based learning under collaborative learning methods (PBL) before the experimental treatment.

H-2 After experimental treatment, the experimental group instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a significantly higher achievement score than control group instructed through conventional method of teaching (CTM).

H3 After experimental treatment, the experimental group instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a significantly higher mean gain achievement score than control group instructed through conventional method of teaching (CTM).

Ho-4 There is no-significant-difference between academic stress scores of control group instructed through conventional teaching method (CTM) and experimental group instructed through Problem-based learning under collaborative learning methods (PBL) before the experimental treatment.

H5 After experimental treatment, the experimental group instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a significantly lower academic stress mean score than control-group instructed through conventional-method-of-teaching (CTM).

H6 After experimental treatment, the experimental-group instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a significantly lower mean gain score on academic stress than control-group instructed through conventional method of teaching (CTM).

H7 There is no significant difference between social competence scores-of control group instructed through conventional teaching method (CTM) and experimental group instructed through Problem-based learning under collaborative learning methods (PBL) before the experimental treatment.

Hs After experimental treatment, the experimental groups instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a

significantly higher social competence mean score than control group instructed through conventional-method of-teaching (CTM).

H9 After experimental treatment, the experimental group instructed English Grammar through Problem-based learning under collaborative learning methods (PBL) will attain a significantly higher mean gain social-competence score than-control-group instructed through conventional method of teaching (CTM).

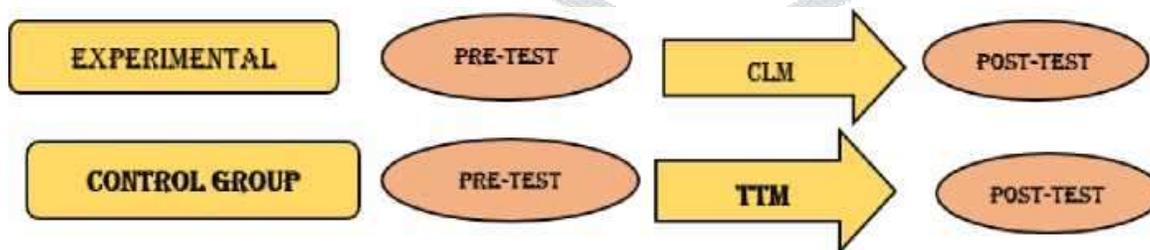
DELIMITATIONS

The present research was bordered as under:

- (i) The study has been conducted on senior secondary school subjects of Bokaro Steel City District only.
- (ii) The study has been confined to collaborative learning method.
- (iii) The effect of applying Collaborative Learning methods will be studied in the case of English Grammar only.
- (iv) The present study has been restricted to teaching inside the classroom.

RESEARCH METHOD

The primary goal of the current research was to espy out the effect of collaborative learning on subjects' achievement in English Grammar. Therefore, Experimental method has been used by investigator to achieve the objective of current study. According to the nature of the exploration, the investigator proposed **quasi- experimental design i.e. pre & post-test experiment and control group design** as it was difficult to use randomization for the selection of samples for experimental study and thus the researcher acquired the sample purposively. Experimental Design for the present study is mentioned below Fig:



The “experimental and control group” consisted two sections of class 9th of “**Govt. Girls Senior Secondary School, Bokaro Steel City**” (affiliated to JBSE). These two sections were divided on the basis of their “intelligence and socio economic status. Problem-based collaborative learning approach (PBL) was used for experiment group whereas Conventional method of teaching (CTM) for control-group.

VARIABLE OF THE STUDY

“Variable is an attribute or characteristics of individuals that researcher study.”

Creswell (2012)

Any function or aspect of a system that affects other events or methods is called a variable. In current research, the primary feature proceeds around the variables. The principal focus of the study is to see the cause and impact. For conducting an experiment four kinds of variables have been employed in this study:

Independent variable/ experimental variable: To study the effect of a variable or treatment for an experiment is known as experimental variable.” To observe the effect of experimental variable is the main consideration in the experimental study. In present research, collaborative learning effect was to be studied on attainment of subjects in English grammar. “For this experimental group was taught through CLM and control group was taught through CTM. So, CLM and CTM were the independent variables of the present study.

Dependent variable/criterion variable: The base on which the effectiveness of the experimental variable is established or studied is known as dependent variable or criterion variable. According to the objectives of the study achievement in English grammar, academic stress and social-competence were dependent variables, which were restrained twice throughout the learning i.e. before the test and after the test.

Control Variable: The effectiveness of the ‘experimental variable’ is inspected by using evaluating with other variables which is known as controlled variable. All the variables cannot be studied at the equal time. Control variables are extraneous variable that an investigator did not want to observe in the study. So, it is integral that these intervening variables ought to be managed to warranty that they will now not have a differential or moderating impact on the relationship between the dependent. and independent variables.

Intervening variable: A variable which intervene the impact of experimental variable on dependent variable is termed as Intervening variable. It is that component which ‘impacts the placed phenomenon however cannot be seen., measured or manipulated’; its outcomes want to be contingent from the consequences of the unbiased and moderator variables on the decided phenomenon. So, it can be considered as a variable that explains a relation or presents an essential link between other variables.

Control Employed: Suitable control was employed to control the variables. Control employed for every of this was as follows:

- i. **School:** A single school for the sample was taken in the study; govt. girls Sen. Sec. school, Bokaro Steel City affiliated to J.B.S.E.
- ii. **Class level:** Class 9th was selected and throughout the experimental treatment, the class was kept regular.

- iii. **Teacher:** Both groups had been instructed by the equivalent teacher.
- iv. **Subject matter:** Both the organizations were taught the same matter of English grammar.
- v. **Socio-Economic Status:** Both groups belonged to equal status.

Intelligence level: Both groups belonged to equal intelligence level.

SAMPLING DESIGN:

“In the social sciences, it is not possible to collect data from every respondent relevant to our study but only from some fractional part of the respondent. The process of selecting the fractional part is called sampling”. In other words, “selection of individuals from the population in such a way that every individual has an equal chance to be taken into sample is recognized as sampling”.

Population:

“Population or universe means the whole frame of explanations, which is the parent group from which a sample is to be molded”. It is the complete area and it constitute of all the item of our research. Here in the present study, subjects of 9th class studying in Govt. Girls Sr. Sec. School of Bokaro Steel city was considered as population. Further it was worth mentioning that this school followed the curriculum given by the **Jharkhand Board of Secondary School Education, (JBSE)**.

Sample

Instead of studying each and every data of population, we take some selected information that is recognized as sample. The principal purpose of the sample is to enable the researchers to conduct the study on subjects selected from the population so that the effects of their study can be used to derive conclusions from the effects obtained from the sample. **“Purposive sampling technique”** was used for the selection of the sample considering the experimental nature of the current study and bearing in thought the feasibility aspect of the experimentation, data collection and with the goal of getting all the required facilities In the current investigation, the investigator chosen 100 learners of ninth class belonging to two sections were selected as sample and after imposing scale of **GGTI and SESS**, these learners have been equated on the basis of their **intelligence degree and socio-economic status**. 2 groups i.e. **E(experimental group) and C (control group)** have been formed by way of dividing all the 100 subjects. These sections have been assigned randomly as **experimental and control groups**.

TOOLS USED

Many specific strategies and procedures have been developed for gathering data, for trying out hypothesis and answering the research questions. The tools employ a special role in unfolding and computing the data. Each tool suitable for certain bases of data, yielding facts of the type and in the can be most efficiently used. Following self-developed standardized present research study were selected and developed:

- 1) Achievement Test in English Grammar
- 2) Lesson plan for Collaborative Learning (PBL)
- 3) Worksheets of Collaborative Learning (PBL)
- 4) Formative Tests

Following **Standardized** tools were used for the present study:

- 5) Verbal intelligence test (GGTI)
- 6) Socio-Economic status scale (SESS)
- 7) Social-Competence Scale (SCS)
- 8) Academic Stress Inventory (SISS) for children

DESCRIPTION OF SELF-DEVELOPED TOOLS:

1. EGAT-IX (Achievement test in English Grammar)

EGAT was developed and standardized by investigator herself with the help of supervisor to observe and quantify the success in English Grammar for class 9 subjects. The final-form of the achievement-test was consisted 70 multiple choice- based questions. One mark for each correct answer has to be awarded. The test-retest reliability was calculated with the help of Karl-Pearson's coefficient of correlation or spearman's Rank difference Method. The test was highly reliable as it consists 0.80 reliability coefficient.

EXPERIMENTAL PROCEDURE:

It was a quasi-experimental research, so that the procedure trailed for the transmission of research comprised of following three stages:

Phase 1: Pre-testing stage: At this stage, 2 sections of the class 9 from Govt. Girls Senior Secondary School, Bokaro Steel City were chosen as sample and 1 section was allocated as experimental group and another as a control group by tossing the coin. After establishing the affinity with the subjects of both the groups *GGTI- Group test of intelligence*¹⁰⁴ and *SESS (Socio - Economic Status Scale)* were directed on the subjects of both the groups. The scores of subjects on both tests were evaluated by t- test and found that both the groups were comparable in terms of intelligence and socio-economic status of the subjects. After ensuring the equality of the groups Academic Stress inventory (SISS), Social-Competence Scale (SCS) and Accomplishment test in English Grammar developed by the investigator were administrated on both the groups.

Phase 2: Treatment Stage: After directing pre-test at the first stage of experiment, treatment was given to the experimental group i.e. the experimental group was taught eleven units of English Grammar through problem- based collaborative learning approach (PBL) whereas conventional teaching method (CTM) was used to instruct control-group. The specific design of Problem-based learning of collaborative method was used for teaching the experimental group in which subjects worked together in small groups to solve the

problems sequentially with thorough feedback at each step.

Phase 3: Post-test Stage: As soon as the instructional treatment was over Academic Stress inventory (SISS), Social-Competence Scale (SCS) and Academic Achievement in English Grammar (EAT) were again directed on both the groups.

STATISTICAL TECHNIQUES EMPLOYED:

For analysis interpretation of data, SPSS version 20.0 along with various statistical techniques such as: Differential statistics - “Mean, Median, S.D. (Standard Deviation) and t-test” etc. were used.

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FINDINGS OF THE STUDY

Pre-test score findings

- I. Academic achievement scores: No significant difference was found in pre-test Academic achievement scores between both the groups i.e. both groups were observed alike in respect to their achievement scores.

- II. Academic stress scores: No significant difference was found in pre-test Academic stress scores for both groups i.e. both the groups were observed alike in respect to their academic stress scores.
- III. Social-competence scores: No significant difference was observed in pre-test social-competence scores for both the groups i.e. both the groups were observed alike in respect to their social-competence scores.

Post-test score findings

- IV. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) achieved higher mean scores in achievement test compared to those instructed through conventional teaching method (CTM).
- V. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) achieved significantly lower Mean score on academic stress compared to those instructed to conventional teaching method (CTM).
- VI. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) scored higher on Social Competence mean scores in comparison to those exposed to conventional teaching method (CTM).

Mean gain score findings

- VII. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) scored considerably higher mean gain score on achievement compared to the subjects instructed through conventional method (CTM).
- VIII. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) scored considerably lower mean gain score on academic stress as compared to the subjects instructed through conventional method (CTM).
- IX. It was observed that the subjects exposed to Problem-based collaborative learning approach (PBL) scored considerably higher Mean gain score on Social-Competence in comparison to the subjects instructed through conventional method (CTM).

EDUCATIONAL IMPLICATIONS OF THE STUDY

From this research investigation, it can safely be resolved that “collaborative learning fosters the development of academic achievement and social-competence and also reduces the academic stress through discussion, clarification of ideas, and evaluation of others’ ideas in groups”. Collaborative learning is an amazing learning technique for supporting all subject to gain content material prerequisites and lift the instructional exercise accomplishments required for prevailing in diverse world. A situation is termed "collaborative in which human beings come collectively in groups, it suggests a way of dealing with humans which respects and highlights person team members' capabilities and contributions." There, is

sharing of authority & acceptance of duty amongst group contributors for the team actions. In the current study, collaborative learning strategy (PBL) was observed more positive than conventional approach of training with respect to subjects' achievement in English grammar decreasing educational stress and improving social-competence. Collaborative learning strategies prove sensible and more reliable to subjects. Thus, a fine impact of collaborative learning on subjects' achievement in English grammar was discovered to be there to propose usefulness of collaborative learning for enhancing subjects' achievement. Problem-based learning of collaborative method is used in the study in which subject study about a problem through the experiences of solving an open-ended hassle in a team of three or four members. The PBL technique of collaborative learning does now not only focus on problem solving ability however it additionally fosters the different appropriate competencies and attributes. This consists of knowledge acquisition, better team collaboration and communication. In the PBL process, every pupil of the team takes on a role with-in the team that can also be formal and casual and position often alternates. Collaborative studies prove to be sensible and broadly satisfactory to subjects. Times when subjects don't understand explanation of any concept then team members are able to make them understand in simpler phrases thus improving subjects' understanding about studying and decreasing the isolation which suggests that collaborative learning reduces character variations and permits all types of subjects to function better. The current study has a vast range of implications in the area of education. Some of them are given below:

- 1) Collaborative learning offers an occasion for a fresh role to the educator. An educator being the only source of facts and figures for educating the reflexive learners in the schoolroom need to adapt the change and be an architect in the education procedure to actively inspire the subjects.
- 2) Collaborative learning makes teaching and learning more exciting both for teachers and learners.
- 3) Collaborative learning proves very operative to make society cohesive and integrated whole by eradicating caste, race, religion and other such barriers.
- 4) The desired social change can be achievable by widely using collaborative learning approach at school and college level in the country.
- 5) Collaborative study “plays a significant role in teacher education”. By giving the current extensive use of collaborative learning at multiple levels, it is vital that teachers comprehend the structure & deliver expressive education experience to subjects.
- 6) The outcomes of the study indicate that by using collaborative learning as an aid the achievement of subjects in English grammar improved significantly. Thus, teachers are suggested that they should create a suitable environment in the classroom which could motivate and support the subjects to participate in learning by understanding. Appropriate guidelines should also be provided to teachers about the effective use of collaborative learning.
- 7) Educators should also be given training for the use of collaborative technique in teaching-learning process as it will help them to create learning environs according to the requirements of their subjects.

- 8) The Education department of each state should organize workshop and seminars for teacher-educators so they can convince more and more about collaborative learning strategies.
- 9) Collaborative learning can be used as an improvement to large group classroom teaching as it is easier to monitor 5-6 subjects in a group than 55-60 individuals in class.

SUGGESTIONS FOR FURTHER STUDIES

- 1) The current study can be imitated to investigate how collaborative oriented learning influences different capacities of subjects. For example, psychological, enthusiastic and inspirational measurements.
- 2) The present investigation was coordinated on ninth class understudies as it were. For simplifications of the discoveries, the investigation could be drawn out to understudies of other instructive levels-essential, auxiliary and advanced education.
- 3) A comparison needs to be drawn b/n Collaborative learning and other training techniques conducted at various grade levels.
- 4) For current study, a sample size of 100 subjects from one school was taken. Study can be conducted by taking large samples from different schools.
- 5) Study can be directed using alternative methods and different population sample.
- 6) The study can be conducted by considering more success measures in terms of additional statistics test.
- 7) To validate the findings, a larger sample for large duration would be helpful.
- 8) Current study has been performed for English Grammar subjects only. Sample from other areas like Math, Science will also be beneficial.
- 9) Cross strategy research can also be performed to check and validate what strategy is valid and beneficial for what group thus adding new strategies as required.
- 10) Some study can be conducted for grouping the effect of collaborative learning with any other methodologies.
- 11) Research can be conducted to study the effect of collaborative learning on special groups of children like specially gifted children, disabled children or any other mildly handicapped children.
- 12) A collaborative learning model can be established for the elementary school learners for catering to the four pillars of Education based on the findings of the study.
- 13) Different school systems are characterized by different standards of excellence in subject morale. It will be a useful research attempt to compare different school systems such as Navodya& central, and public & ordinary in respect to the variables used in the study.
- 14) An experiment can be conducted to study effects of collaborative learning across multiple geographies, different gender (boys/girls) and localities (rural/urban).
- 15) The study has been conducted using quasi-experimental design. Further researches may be conducted by employing true-experimental design using randomized sample.

CONCLUSION

Principle motivation behind present investigation was to survey "the effectiveness of problem based collaborative approach over the conventional teaching method on subjects' academic achievement in English grammar." Many researches, have found that collaborative learning is one of the best and effective way to maximize learning of subjects and academic achievement of their classmates. To analyze the viability of collaborative learning a pseudo-trial "pre-test, post-test control & experimental group was embraced. CTM for control group and CLM for experimental group was adopted and the comparison of both is of great inferences. "In CTM, the learner is a passive recipient of knowledge given by the teacher whereby making teacher a very important component of his strategy. Whereas CLM represents a paradigm where the learner is creator and innovator of knowledge. Thus, role of learner is very active in CLM and the learning is peer-paced. Despite many limitations, overall influence of collaborative learning on subjects' achievement was observed to be very positive and significant. Though there are many factors which impacts subjects' success but from the analysis of the study, it was found that collaborative activities may have significant impact. Many collaborative methods and technology in its various forms were integrated purposefully in instructional and curricular design which helped to expand subject teamwork and thus their communal and academic success. Moreover, "the students' fields & experimental. treatment level is significant to understand the influence of collaborative-learning on subjects' achievement". Collaborative methodology can be very helpful in teaching STEM subjects (Science, Math, Technology and Engineering) and NON-STEM subjects (Psychology, languages and Humanities etc.) at ease. While span of treatment directs the degree of collaboration among subjects nonetheless the purposes behind favoring little term over longer length rely upon subjects' inclinations, instructor accessible time and nature of substance.

A valuation for subjects' needs and intrigue can likewise assist them with choosing their agreeable alternatives concerning strategies. In general, "the findings of the investigation are significant for teachers, students and educational plan fashioners to take learned conclusions on the circumstances & assortments of collaborative exercises to be secured while arranging, planning and forcing positive instructional techniques. For instance, an instructor may likewise name collaboration- oriented exercises dependent on expressions, lifestyle and neighborhood issues identified with science, condition and wellness to improve group ventures. These activities will fill two needs information presentation and improvement of important aptitudes. Further these discoveries may also direct educators in construction options of sorts and elements of innovation practice in their schoolroom. For example, the utilization of enlarged and computerized reality can help make a surrounding to invigorate logical and normal wonders". For example, investigation of stars and systems, seismic tremors and earth. Findings on the diverse relevant components, for example, grade levels and issue spaces alongside term of treatment will help advice subject specialists and scientists to upgrade subjects' learning. At long last, these conclusions have brought to the comprehension of the areas and have recreated the outcomes of the prior investigations.

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