Enhancing Students' Academic Achievement through 3 Tier Remedial Class System

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Abstract

Remedial class is not new in educational parlance for uplifting the low achievers to the expected competency level. Despite the numerous remedial classes being conducted in Gelephu Higher Secondary School in different forms such as, after school questions solving in groups and teacher supervised studies, no study has been done to test its effectiveness. An action research was carried out to improve students' academic achievement through systematic remedial classes. A pre-test on selected chapters was conducted to check the existing level of competency of all the students from selected section of classes 10 and 12 in different subjects. A modified 3Tier remedial intervention was given for 3 weeks; remedial to whole class, peer tutoring in smaller groups, individualized tutoring and quality answer writing. A post-test, based on same blue print as for pre-test, was administered to check on the level of improvement. Further, a survey on satisfaction level in students due to remedial classes was also conducted. Pre-test scores and post-test scores were compared through five-number summaries and means. Responses from the satisfaction survey were analyzed using SPSS software. The results of the research revealed that the academic performance of participants improved. The participants were positive about the effect of remedial classes conducted for them. The research recommends that remedial classes be conducted with appropriate intervention for all the subjects across schools to improve the academic performance of students.

Key words: Remedial, 3Tier intervention, peer tutoring, individualized tutoring, quality answer writing, improvement, academic performance.

Introduction

Gelephu Higher Secondary School (GHSS) is located 1.3 kilometre away from Gelephu town. GHSS falls under the jurisdiction of Gelephu Thromde under Sarpang Dzongkhag. It is a co-educational day school with an annual enrolment of 865 students ranging from classes nine to twelve. The school offers Science, Mathematics, Language, social studies and commercial studies. Students are also provided elective subjects such as Computer Applications, Environmental Studies, Media Studies, Vocational Studies and Agriculture for Food Security. Life skills and value education, that nurture children holistically, are imparted through various co-curricular and extracurricular activities.

The prime goal of school education system is to deliver education that would foster the children to be innovative, creative and enterprising to join the world of work in a competitive job market (Planning Commission, 1999). From pre-primary till the college, there are some forms of assessments conducted to maintain standard

in each level. The academic achievement in a subject is measured by the mean score obtained in the examinations. The students of class ten and class twelve sit for common examinations conducted by Bhutan Council for School Examination and Assessment (BCSEA). The performance in these examinations determines whether the students can continue their education in government schools/colleges. So, students and the teachers put their best effort to achieve good scores.

Factors such as number of students in the class, students' background, quality and duration of classroom instruction, parental support and availability of remedial support by teachers affect individual student's academic performance. Since children come from diverse background, all the students may not have the same capability to comprehend ideas and concepts at the same pace in the class. Some students may get help from parents or guardians at home but others are deprived of such help. This leads to the requirement of remedial classes. According to Schwartz (2012), remedial classes are education programs defined as specific educational interventions aimed at addressing learning needs of a targeted group of children who are lagging behind academically or not mastering specific competencies. Similar classes separate or along with low achievers, can be conducted for the high achievers to accelerate their learning or to facilitate them to perform even better. The remedial classes consisting of all the students promotes peer tutoring which is one of the strategies of remedial education (Starr, 2009).

Poetry is one of the most difficult genres for the students to learn as it requires varied interpretation. Students also express difficulties to understand the elements of fiction in short stories and novel. Transferring concepts learnt in Physics, Mathematics and Biology and applying them to solve problems is yet another difficulty faced by students due to change in curriculum. New curriculum requires a change in classroom environment which includes more peer and group work and emphasis on communication. Royal Education Council [REC] (2015) stated that it is only in such ways that students will really become engaged in thinking scientifically and mathematically instead of being mere spectators. In addition, there is no prescribed textbook in Geography. The concepts are taught from various references which need to be interpreted in Bhutanese context which is difficult. The prescribed textbook supplied for Computer Application is outdated and equipment in the lab is inadequate. This situation necessitates additional information input and time.

Problem Statement

The BCSEA 2016 result upon analysis by School Examination Committee revealed that out of 229 students of the school who sat the Bhutan Certificate for Secondary Examination (BCSE) in 2016, only 124 students qualified for higher studies, that is

about 52.5 %. Also in the Bhutan Higher Secondary Examination Certificate (BHSEC) examination 2016, out of 206 students, only 77 (37.4%) students qualified for undergraduate or diploma courses offered by various colleges in and outside the country which is poor compared to the achievements of boarding schools. Students in this school do not have scheduled and monitored study hours as can be found in boarding schools of Bhutan. This means, the overall academic performance is very much dependent on the number of study hours children spend on their study table, preferably, with someone who could clear their doubts that they may have.

Remedial classes have been tried out in GHSS in the past but its effect on students' performance have not being studied. It is generally felt that remedial class does improve academic achievement. So, there is a need for a study to investigate the effect of remedial classes (integrating suitable teaching/learning strategies) on students' performance. Thus, it has become important to consider a more integrated approach of remedial programs that develop students' interests and self-confidences in the subjects which eventually results in excellent average performance. The purpose of this study, therefore, is to investigate the effectiveness of remedial classes (After School Alternative Program) in enhancing academic achievement of class ten and twelve students of GHSS.

Reconnaissance

Situational Analysis

It is almost a norm for teachers to help students in scoring higher marks in examinations. Schools try various ways to help students obtain good marks in the examinations, especially the board examinations. According to Pupil Performance Report (BCSEA, 2016) schools are said to perform well academically on the basis of mean scores in these examinations. GHSS cannot be an exception to not to give its students opportunities and support to obtain good scores. In the past years (2010-2014), students obtaining scores below 40% in the midterm examination were given instructional support as a remedial measure while other student scoring higher than 40% were not required to attend. This arrangement did not serve its objective because the students who were supposed to attend remedial classes either purposely absented themselves or were not interested in remedial sessions. Most of the students shared about their embarrassment as it gave them feeling of being labelled as weak students. Thus, the school had to stop the remedial sessions altogether. However, in 2015 and 2016 all students appearing the board examination were made to stay back for one hour after the regular classes were over. Subjects perceived to be difficult by students, such as Mathematics, English, Science, Accountancy and

Dzongkha were allotted for a week-long one hour after-class sessions for remedial classes. During the week-long session, respective teachers gave review questions chapter-wise and students answered through discussion amongst themselves in small mixed ability groups. Students who obtained high scores in mid-term examination in the subjects led discussions. Teachers visited the classes to help with the complex doubts and difficult concepts.

Success of such system was neither studied nor recorded for retrospection. Some teachers claimed that the peer-support remedial sessions were useful, as it had improved scores in their subjects. However, other teachers said it was just a waste of time and did not help children. They also expressed fears that it might continue the same way in the future. Many teachers expressed the need for a study to look at the effectiveness of remedial classes on students' scores. In this study, some teachers collaboratively organized remedial classes for students of classes ten and twelve in the subjects they taught. These teachers wanted to try a systematic way of helping students so that mean score of the students in their subjects improve. These teachers believe that remedial classes have to be planned well and specific strategies have to be used for a positive outcome. From the way the remedial classes were conducted in the past years, it indicates that it was a partially a failure. Therefore, taking the lessons from the past experiences, remedial classes need to be organised in a systematic manner so that it turn out effective for students' academic achievement.

Competence

The research team consisted of seven teachers with five to twenty three years of teaching experiences. They also held other responsibilities in the wide range of fields such as, school academic head, cluster lead teacher, head of department, examination coordinator, head of Information Communication Technology department and class teacher. Some have even facilitated national level teacher Professional Development programmes, written academic textbooks and participated in national level curriculum conference. The researchers teach subjects such as English, Mathematics, Physics, Computer Applications, Biology and Geography in classes nine to twelve. Most of them have conducted research during their pre-service training or for their Master's degree, which has given enough footings for conduct of action research. One of the researchers has to his credit research papers published in international journals and conference proceedings. The cluster lead teacher being one of the members in this research team conducted the action research training to the rest of the researchers, which was given to the lead teachers by the Royal Education Council. The Principal and Vice Principal of the school were critical friends for this action

research as they possess more than 20 years of teaching and administration experiences in schools. The participants for this research consisted of mixed ability and gender studying in class ten and twelve in GHSS in the age range of 15 to 20 years. Although, most of the students were familiar with the research process but they had not participated in the intervention of any action research.

Literature Review

Modern education in Bhutan dates back to 1914 when subjects such as English, Arithmetic, Hindi and Dzongkha were taught in the schools. It emphasised development of skills and knowledge, which they believed would produce citizens like doctors, engineers, administrators which would be useful for the development of the country (Rabgay, 2012). The system gave special attention to inculcate "principles and values including critical and creative thinking, ecology literacy, practice of the country's profound ancient wisdom and culture, contemplative learning, a holistic understanding of the world, genuine care for nature and others to deal effectively with the modern world, preparation for right livelihood and informed civic engagement" (Karen, 2009). Despite the various efforts by the government to improve the quality of the education in schools, undesirable trends like the teacher-centered classrooms, rote learning and exam-oriented learning still prevailed which resulted in poor student academic performance and achievements. Due to poor academic performance, most students failed to continue higher education and that hindered in producing skilled people for developmental activities in the county. Many researchers as well as our own personal experiences as teachers have confirmed that the answers students write in the exams are just regurgitation of what they have learnt by heart. Any twist or rephrasing of the questions made most students unable to answer the questions.

According to Lever-Duffy and McDonald (2005), learning is a complex activity that can be seen differently depending on individual's needs, because the perception of learners differs on how and why they do that way. The learning can take place in three different means such as, auditory, visual, and kinesthetic. Learning includes the selection, arrangement, and information delivery in a suitable environment and in the way learners interact with the information (Smaldino, Russel, Heinich, & Molenda, 2005). Riding and Smith (1997) stated that every individual have different learning abilities and styles, and they possess and represent knowledge in diverse ways. Some students learn more effectively when taught with their preferred methods.

Therefore, it is important to open up the 'black-box' of remediation strategies and identify which types of intervention have an impact on students' outcomes

and in what context. For instance, Xin and Jitendra (1999) indicated that length of teaching time (intervention) has significantly higher effects than short- or intermediate-term interventions for group-design studies. Similarly, as group or individual teaching, different teaching orientation, after school alternative program (Remedial classes) are also very important and has a wealth of explanatory power (Lin, 2013). Remedial interventions are the process of creating more time for our academically challenged students to get additional academic supports, so that these groups of children achieve incremental growth in their score card. However, the general perceptions that are commonly observed in our education system restrict remedial intervention only to weaker students. The very concept of remedial classes can be applied to academically performing students to improve and excel in their learning.

Remedial education is an indispensable part of teaching and learning process. Its results proved that remedial class's policy, strategy, and techniques have a positive effect on improving low achievers. This improvement pushes up low achievers to their grade level on one hand, and raise their motivation towards learning on the other hand (Jarrar, 2014). He further recommends that teachers should give more emphasis to remedial techniques while teaching, and cooperate with remedial teachers to help low achievers and make progress in their achievement. Schwartz (2012) stated in a paper published for Global Partnership for Education that remedial interventions, in an ideal situations, should be part of the national education policy that calls to make necessary arrangement in training of teachers, pedagogy and materials.

The Royal Government of Bhutan (RGoB) has been at the forefront in advocating education for all. In its Education and Policy Guidelines (EPGI), districts and schools are directed to provide remedial classes to students so that the dropout rate is low. According to the of National Education Assessment (NEA), 2013-14 report (BCSEA, 2015) various support systems such as remedial classes, additional study measures, guidance and advice, access to learning materials and conducive learning environment given to the students have increased student performance in class 10 Mathematics and English. The report also recommends that teachers must take remedial classes.

According to Huang (2010) the goal of remedial classes is to provide low-achieving students with more chances to reinforce the basic knowledge in common subjects, so that they can meet minimum academic standards. In order to achieve this, it is important for teachers to make a little more effort to give extra coaching to students. Echevrriam (2003) stated that an effective remediation must affect or change the classroom practices in which a teacher uses instructional tasks that draw on students' prior experiences and interests, which relates those experiences to new learning. Remedial classes should include use of supplementary materials to make lesson

concepts clear and meaningful. The tutor should use different strategies to cater to the needs of individual students. Eventually, precise and comprehensive diagnosis methods are needed to facilitate students' classification and as a result designing or choosing appropriate remedial strategies that render to better performer.

A study conducted by Panlilio (2012) found that remediation alone has no observable effect on the measures to evaluate the outcomes of under-prepared students. Moreover, Schwartz (2012) stated that there is academic improvement from remedial classes but he argues that long-term benefits depend on the type of remediation and how systematically it is organized. Remediation as an intervention was found to be statistically significant influencing academic outcomes. Beside all the above, providing extra hours to those academically low achievers is the greatest challenge in a day school. Each year a large number of students graduate middle secondary school but only 50% of them qualify for higher secondary school. Parents and the educators are often confused as how to prepare those leftover 50% students for colleges (Venezia, 2005). Researches have indicated that students must be given remedial classes before enrolling into higher secondary school and colleges.

According to Choden (2005), when individual attention and special care were given to the weaker students through remedial classes, they tended to perform better than teaching all students in the class. She observed, although providing remedial classes to the students was a tedious job in the beginning but when improvement was seen in students, she got certain sense of satisfaction. It further boosted her energy to help students to perform even better.

Response to Intervention (RTI) is a 3-tiered remedial intervention that is popularized in K-12 schools across the USA. The National Research Centre for Learning Disabilities defines RTI as "an assessment and intervention process for systematically monitoring students' progress and making decisions about the need for instructional modification or increasingly intensified services using progress monitoring data", (Johnson, 2006). At each tier of the intervention, strategies used are research based and systematic according to the need of the individual child and have proved positive in screening process. In the work done by Fuchs (2006), the strategies become intensified and more individualized as the screening process goes on. The 3 tiers are as follows (Figure 1):

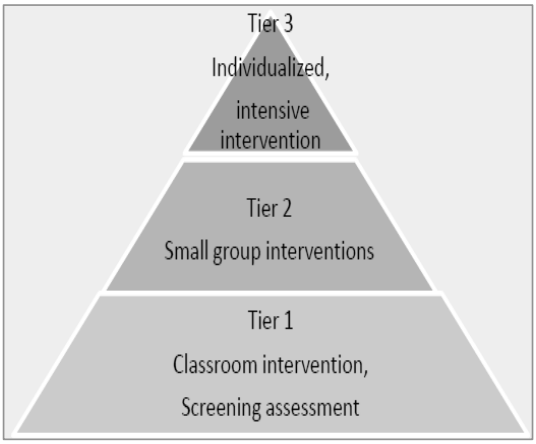


Figure 1: Response to Intervention (RTI)

Tier 1: In this tier, support is delivered to the identified students during regular class room instruction to the whole class,

Tier 2: In this tier, support is provided almost always small-group instruction. The group consists of students who could not be remediated in tier 1, and

Tier 3: In this tier, support is provided to one-to-one tutoring, other intensive ser vices, or possibly assignment to special education (Schwartz, 2012).

RTI or 3-tier intervention model can be adopted to give remedial classes involving the whole class. Peer tutoring is another effective remedial measure that has resulted in increased students' achievement (Horbath, 2011). High achieving students can be made to tutor their low performing peers. Its effects are double fold; tutor as well as tutee benefit academically from such a partnership and tutees get their self-esteem boosted (Clarkson & Luca, 2011)

Research Question

How can students' academic performance be improved significantly through systematic remedial classes?

Research Design

The objective of this study is to examine whether remedial classes improve the academic performance of students. This study employed quantitative method, such as Multiple Choice Questions (MCQ), short response questions and extended response questions for pre- and post-tests. In this study, the performance test items were developed to compare the performance level before and after the interventions for 3 weeks. Finally, to assess students' level of satisfaction for the program, the attitude survey questionnaire using 5-point Likert scale was developed and administered after completion of the remedial program with randomly selected participants.

Participants

The participants for this research consisted of class ten and class twelve students of GHSS. Since the research method demanded high achievers to help the academically poor students, all the students in the five sections of class ten and three sections of class twelve were taken for remedial classes. There were 227 participants, both male and female in the age range of 15 to 20 years. There was no selection method: it was almost automatic to choose the above sections due to the fact that the researchers taught the subject to those sections. The remedial classes were given in

Literature, IT, Physics and Mathematics to class ten and Literature, Biology and Geography to class twelve (See Table 1).

Table 1:
Concepts and Topics that were dealt with during the Remedial Session

Class	Subject	Concept	Duration (hours)
10	Literature	Novel and Short Story	20
	Mathematics	Non-Linear functions and equations	20
	Physics	Work and Energy, Electricity	20
	Computer Applications	Network and Introduction to Internet	20
12	Literature	Poetry	20
	Biology	Theories of evolution	20
	Geography	Transport and Communication	20

Intervention

Remedial intervention was given to the above-mentioned participants for three weeks after the regular classes as in case of After School Alternative Program in Taiwan. It was learnt from the literature review that although remedial is usually meant for students that performed poorly but can also be given to all the students so that overall mean can be increased, at the same time high achievers tutored the low achievers. RTI (3-Tier intervention) framework, which proved very effective, was adapted to suit our scenario as described below:

Tier 1: Teacher presented the concepts from the topic to the whole class.

Tier 2: High achiever students coached low achievers in small mixed ability groups. Low achievers were identified through observation of their responses in tier 1 and looking at the performance in the pre-test. Different students were made to present the topic that was being discussed in the group.

Tier 3: Teacher gave individualized help to targeted low achievers. They were identified through observation of performance in tier 2. Students were taught how to answer different level of questions according to the marking scheme usually followed in the BCSEA. The quality time the teacher spent with the individual student helped to boost their confidence in themselves as well as the subjects.

Research instruments

The following instruments were used in collecting data.

1. Performance Tests

The performance tests were classified into two categories, pre- and post-test respectively. Both the tests consist of Multiple Choice Questions (MCQ), short response questions and extended response questions but were parallel in nature. The tests were administered for 30 marks that could be answered in an hour. The test items were purely based on the concept/content that was taught with the following learning objectives in respective subjects.

a) Pre-test

The objective for implementing pre-test was to determine the level of knowledge that the student possessed prior to implementation of the remedial program. So, it was conducted before the start of the program in all those pilot classes respectively.

b) Post-test

Similarly, the objective of administrating post-test was to investigate students' level of performance in the subject after participating into 3 weeks interventions in term of learning outcomes. So the test was implemented at the end of the program.

2. Satisfaction Questionnaire

A 5-point Likert scale questionnaire was developed and administered to investigate students' attitude/satisfaction level towards the 3 weeks remedial program (Appendix A). The data collected from the questionnaire was analyzed in terms of mean scores and standard deviations to determine the satisfaction level towards the program.

3. Class Observations

Observation of general behaviour of each of the students in each of the classes taken for intervention was done. Day-to-day anecdotal records were kept for each of the students by the teachers. Anecdotal records form the third source of data. Any slight as well as critical shift in the students' behavior in each of the tier of the intervention was recorded.

Validity and reliability of instruments

The same test specification was used for making pre- and post- performance tests in each of the subjects. The test items were adapted from BCSE and BHSEC questions which have been validated by a team of subject specialists. The satisfaction survey questionnaire having 5-point Likert was adapted from Students' Satisfaction Questionnaires published in journal of education and culture. The items in the questionnaire were revised and standardized accordingly as to fit into the Bhutanese students' grade and understanding. The final set of items in the questionnaire was validated by research expert from Royal Education Council, Paro.

Data analysis

To analyse the data following procedure were used:

- Mean
- Box and whisker plots/Box plots
- Anecdotal records from class observations

Although there are numerous graphs used to see how a data set is distributed, all the display do not directly show how the data is related to the median. Box plot was used to see how specific pieces of data compare to the median. The data was grouped into four intervals, which are centred around the median.

The values for Q1, Q2, and Q3, along with the minimum and maximum values, in order from least to greatest, is called the 5-number summary for a data set and is used to frame the construction of the box and whisker plot (Small, 2007).

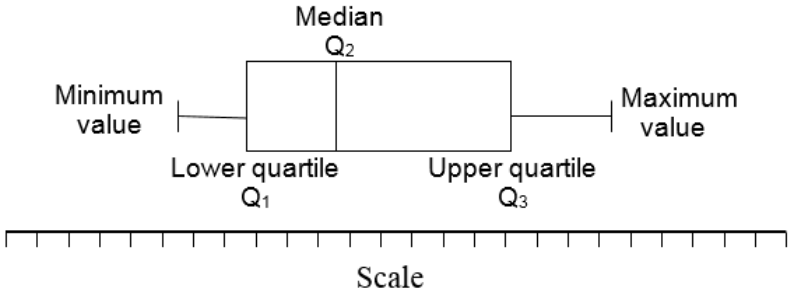


Figure 2: Components of box and whisker plot

A box plot shows how the data is distributed relative to the median:

- ❖ The width of the box in relation to the median indicates how the middle 50% of the data is clustered around the median.

- ❖ A wider box indicates a greater spread in the middle 50% of the data.
- ❖ Longer whiskers indicate a greater spread between the extreme values and the upper and lower quartiles.

Data collected from anecdotal records was inspected for any shift in the behavior towards learning. The data consisted of behaviors such as, answering a questions, taking part in discussion, raising a doubt and solving a problem individually. Such behaviors were filtered from other records and said to be caused due to the intervention.

Results

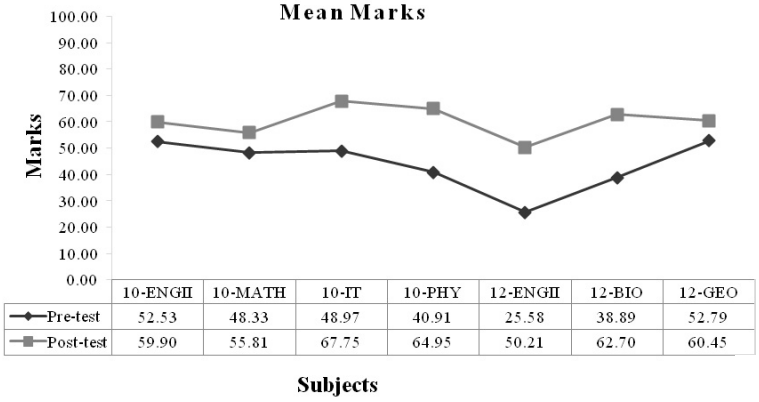
Performance tests

A pre-test was administered to the participants covering a number of chapters that were taught in the past. The questions asked were Multiple Choice Questions, Short Answer Questions and Long Answer Questions for 30 marks that could be answered in an hour. The participants were informed of the pre-test a day before the actual test so they become mentally prepared. The score was taken and analyzed by calculating the mean mark and box and whisker plots in each of the subjects.

A post-test was conducted following an intervention period of three weeks. The questions for the post-test were parallel to the pre-test questions (Test Specification for both the test was the same). Students were made aware of the test a day before the test. The post-test score was compared with the pre-test score, and analyzed and interpreted.

Data analysis (subject wise)

Mean marks for pre-test and post-test for class 10 and 12



	10-ENGII	10-MATH	10-IT	10-PHY	12-ENGII	12-BIO	12-GEO
Pre-test	52.53	48.33	48.97	40.91	25.58	38.89	52.79
Post-test	59.90	55.81	67.75	64.95	50.21	62.70	60.45

Figure 3: Mean marks for pre-test and post-test in all the subjects.

Figure 3 shows the comparison of mean marks before and after the intervention in all the subjects. It is observed that there is increase in mean mark after the intervention in all the subjects. Further, the detail analysis of scores of individual subjects before and after the intervention program is given below.

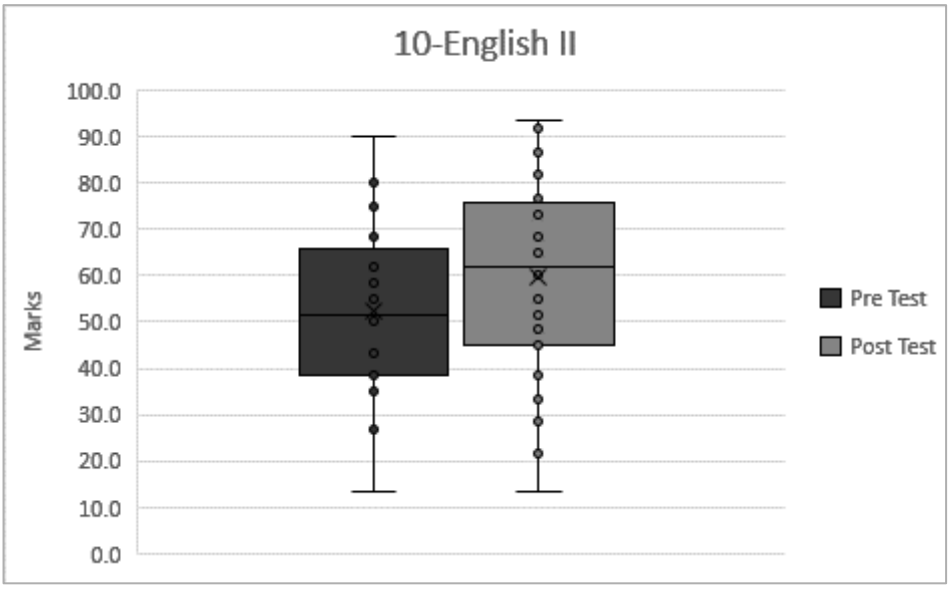


Figure 3: Box-plots for pre-test and post-test in 10 Literature

The median (N=33) marks are 51.67 and 61.67 in pre-test and post-test respectively. The lowest marks are the same in both the test which is 13.33. The maximum marks are 90.00 and 90.33 in pre-test and post-test respectively. The middle 50% of students scored between 38.33 and 65.83 in pre-test, and between 45.00 and 75.83 in post-test. The mean mark is 52.53 in pre-test and 59.89 in post-test.

It is seen that the performance in 10 English II improved after the remedial intervention since maximum mark, mean and median have increased by 0.33, 7.36 and 10.00 respectively, and range of marks of middle 50% of students has shifted upwards.

The median (N=31) marks are 50.00 and 60.00 in pre-test and post-test respectively. The lowest marks are the 6.67 and 16.67 in pre-test and post-test respectively. The maximum mark is both the test is the same at 100.00. The middle 50% of students scored between 36.67 and 66.67 in pre-test, and between 36.67 and 71.67 in post-test. The mean mark is 48.33 in pre-test and 55.81 in post-test.

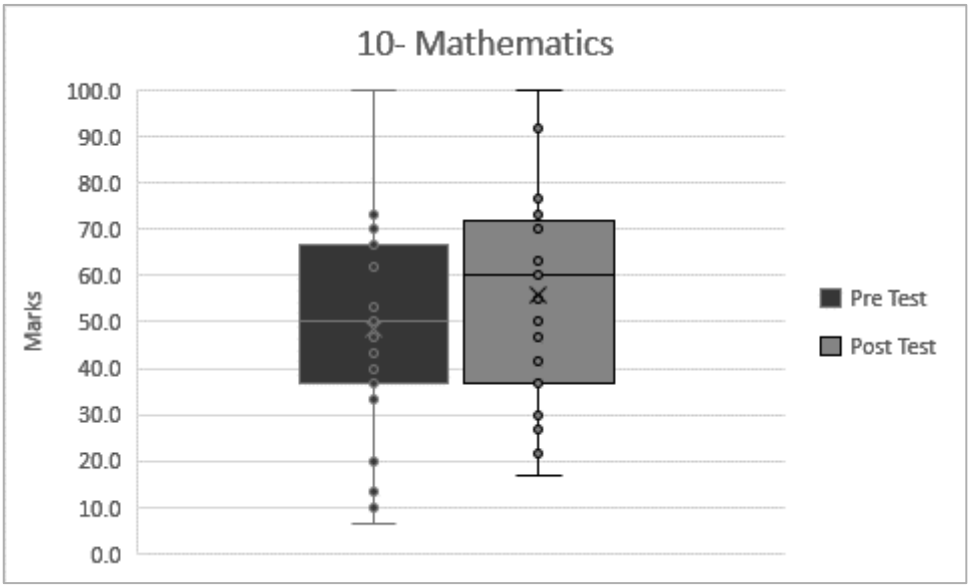


Figure 4: Box-plots for pre-test and post-test in 10 Mathematics

It is seen that the performance in class 10- Mathematics improved after the remedial intervention since minimum, mean and median have increased by 10.00, 7.48 and 10.00, and range of marks of middle 50% of students has shifted upwards.

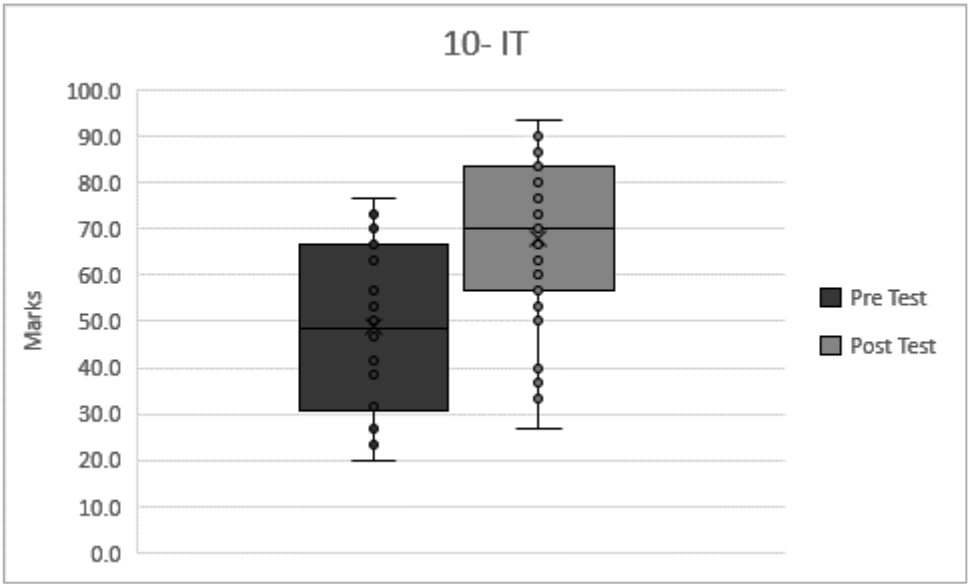


Figure 5: Box-plots for pre-test and post-test in 10 Computer Application (IT)

The median (N=34) marks are 48.33 and 83.33 in pre-test and post-test respectively. The lowest marks are 20.00 and 26.67 in pre-test and post-test respectively. The maximum marks are 76.67 and 93.33 in pre-test and post-test respectively. The middle 50% of students scored between 30.83 and 66.67 in pre-test, and between 56.67 and 83.33 in post-test. The mean mark is 48.97 in pre-test and 67.75 in post-test.

It is seen that the performance in class 10 computer application improved after the remedial intervention since maximum mark, mean and median have increased by 16.66, 18.78 and 35.00 respectively, and range of marks of middle 50% of students has shifted upwards.

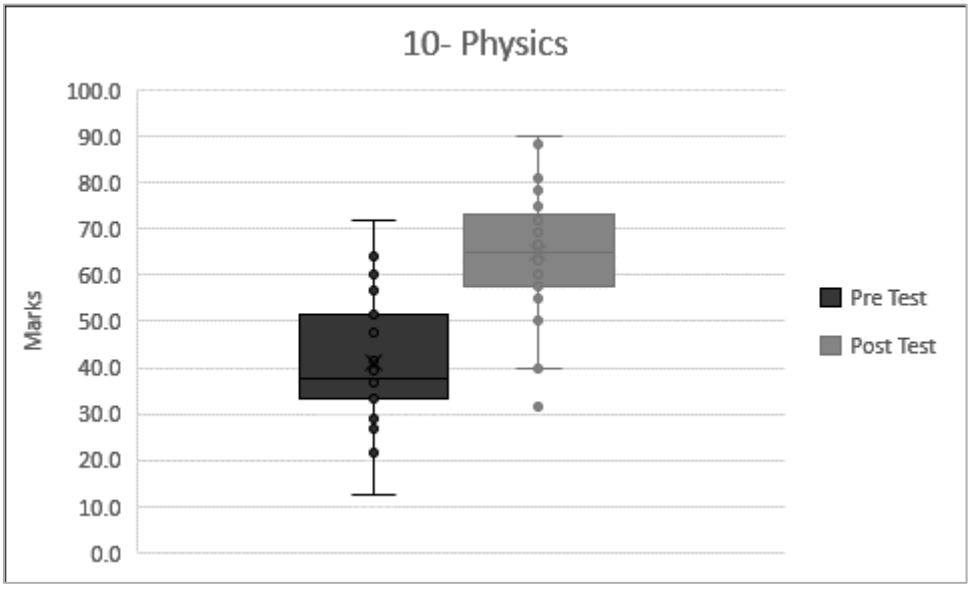


Figure 6: Box-plots for pre-test and post-test in 10 Physics

The median (N=31) marks are 37.50 and 65.00 in pre-test and post-test respectively. The lowest marks are 12.50 and 31.67 pre-test and post-respectively. The maximum marks are 71.67 and 90.00 in pre-test and post-test respectively. The middle 50% of students scored between 33.33 and 51.67 in pre-test, and between 57.50 and 73.33 in post-test. The mean mark is 40.91 in pre-test and 64.95 in post-test.

It is seen that the performance in 10 Physics improved after the remedial intervention since minimum mark, maximum mark, mean and median have increased by 19.17, 18.33, 24.04 and 27.50 respectively, and range of marks of middle 50% of students has shifted upwards.

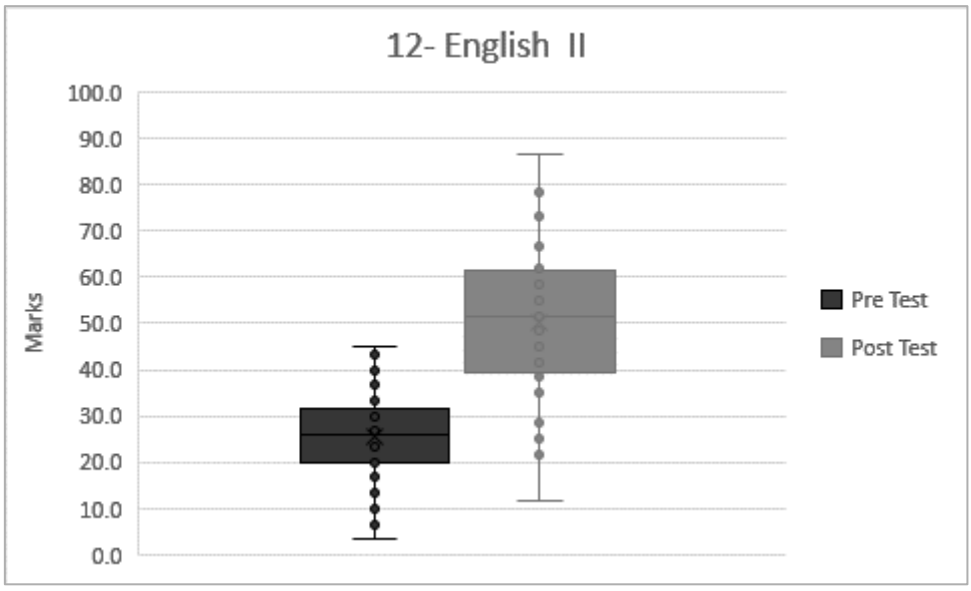


Figure 7: Box-plots for pre-test and post-test in 12 Literature

The median (N=40) marks are 25.83 and 51.67 in pre-test and post-test respectively. The lowest marks are 3.33 and 11.67 in pre-test and post-test respectively. The maximum marks are 45.00 and 86.67 in pre-test and post-test respectively. The middle 50% of students scored between 20.00 and 31.67 in pre-test, and between 39.17 and 61.25 in post-test. The mean mark is 25.58 in pre-test and 50.21 in post-test.

It is seen that the performance in 12 English II improved drastically after the remedial intervention since minimum mark, maximum mark, mean and median have increased by 8.34, 41.67, 24.63 and 25.84 respectively, and range of marks of middle 50% of students has shifted upwards.

The median (N=21) marks are 37.67 and 61.67 in pre-test and post-test respectively. The lowest marks are 13.33 and 31.67 in pre-test and post-test respectively. The maximum marks are 68.33 and 100.00 in pre-test and post-test respectively. The middle 50% of students scored between 30.00 and 50.00 in pre-test, and between 50.00 and 75.83 in post-test. The mean mark is 38.89 in pre-test and 62.70 in post-test.

It is seen that the performance in 12 Biology improved after the remedial intervention since minimum mark, maximum mark, mean and median have increased by 18.34, 31.67, 23.81 and 24.00 respectively, and range of marks of middle 50% of students has shifted upwards.

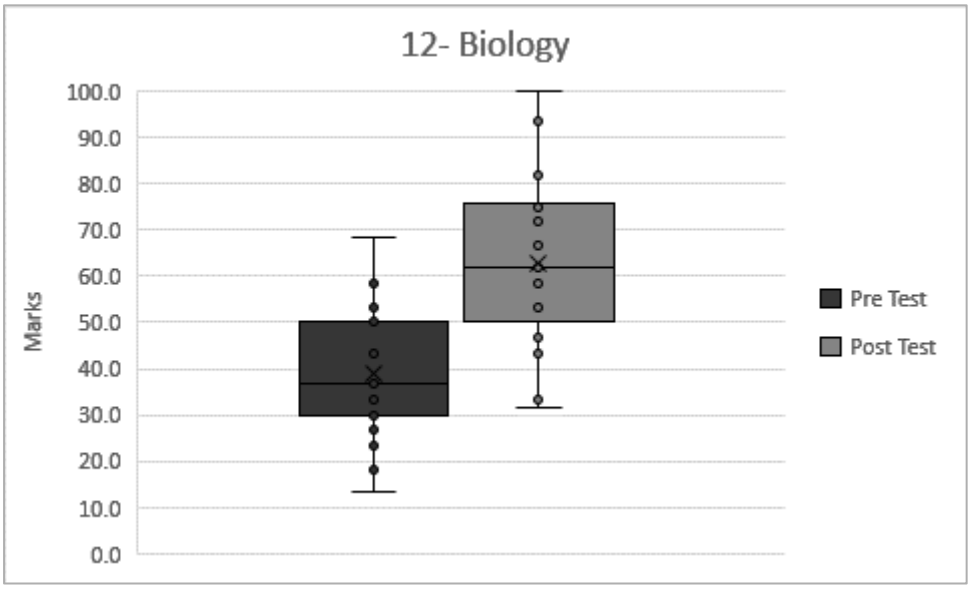


Figure 8: Box-plots for pre-test and post-test in 12 Biology

The median (N=37) marks are 53.33 and 61.67 in pre-test and post-test respectively. The lowest marks are 30.00 and 20.00 in pre-test and post-test respectively.

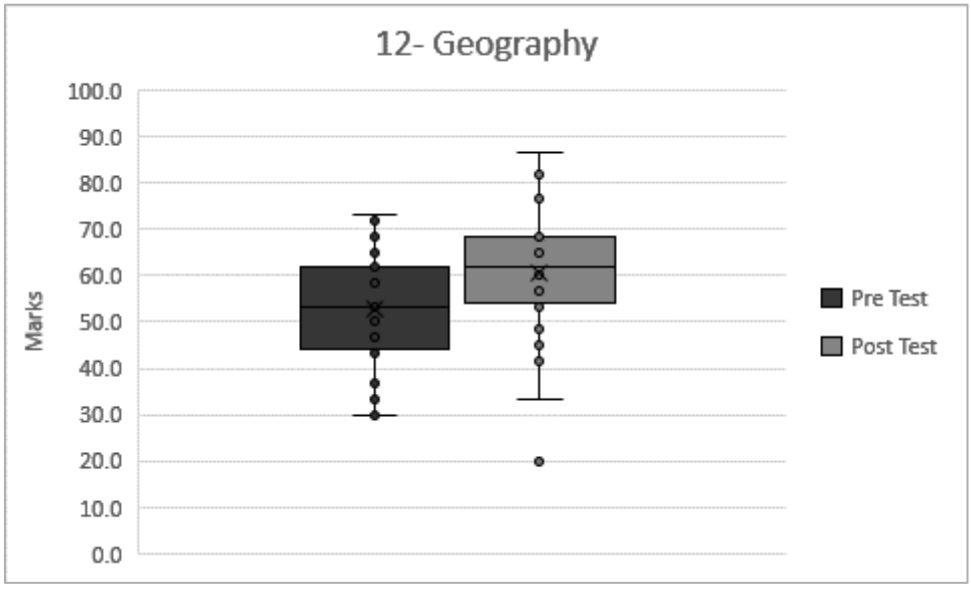


Figure 9: Box-plots for pre-test and post-test in 12 Geography

The maximum marks are 73.33 and 86.67 in pre-test and post-test respectively. The middle 50% of students scored between 44.17 and 61.67 in pre-test, and between

54.17 and 68.33 in post-test. The mean mark is 52.79 in pre-test and 60.45 in post-test.

It is seen that the performance in class 12 Geography improved after the remedial intervention since maximum mark, mean and median have increased by 13.34, 7.66 and 8.34 respectively, and range of marks of middle 50% of students has shifted upwards. However, the minimum mark in class 12- Geography after the intervention has decreased.

Learning satisfaction analysis

The survey questionnaire was administered with participating students to investigate their learning satisfaction towards the four-week remedial program. The questionnaire consisted of 14 items around students' attitude, students' interest, participation and learning satisfaction. 114 students answered the questionnaire.

The data collected was analyzed by mean and standard deviation to determine the learners' satisfaction level and learners' attitude towards the remedial program. The mean of each item for learning satisfaction was compared with the mean of other items as shown in Table 1.

Table 2

Summary of Students' Satisfaction Survey Questionnaire

	Satisfaction	Mean	SD	Rating	%
1	I took remedial classes seriously.	4.15	0.81	Strongly Agree	83%
2	Remedial duration of three weeks was enough.	3.56	1.20	Agree	71%
3	Remedial classes timing was appropriate.	3.83	1.22	Agree	77%
4	I could follow instructions during remedial class better than normal classes.	3.72	1.01	Agree	74%
5	I was encouraged to participate in the team discussions.	4.45	0.78	Strongly Agree	89%
6	I enjoyed interacting in a team.	4.46	0.80	Strongly Agree	89%
7	I was helped by my friends to learn better.	4.39	0.67	Strongly Agree	88%
8	Teacher gave me individual attention.	3.61	1.09	Agree	72%
9	Teacher engaged me actively and meaningfully.	4.12	0.93	Strongly Agree	82%
10	I felt closer to the teacher after the remedial classes.	3.90	0.89	Agree	78%
11	I acquired skills and techniques to answer different type of questions.	4.22	0.88	Strongly Agree	84%

12	I am confident about my own abilities after the remedial classes.	3.82	0.91	Agree	76%
13	Remedial class was helpful.	4.55	0.73	Strongly Agree	91%
14	I recommend such remedial classes in future.	4.15	0.81	Strongly Agree	92%

The overall analysis from the questionnaire revealed that 83% to 89% of learners "Strongly Agree" that they took remedial classes seriously, remedial classes encouraged them to participate in the team discussions, enjoyed interacting in a team, helped by their friends to learn better, teacher engaged them actively and meaningfully, and acquired skills and techniques to answer different type of questions. 71% - 78% of the participants "Agree" towards remedial duration of 3 weeks was enough for particular unit, appropriateness of remedial class timing, able to follow instructions during remedial class better than normal classes, teacher's attention to individual learner, in developing close relation with subject teacher and confident about my own abilities after the remedial classes. Interestingly, more than 90% of the participants rated "Strongly Agree" that remedial class was helpful and recommend such remedial classes in future as shown in Table 2.

Class Observation analysis

It was observed that students showed more interest, were motivated to take part in discussion, and the frequency of clarifying doubts with teachers and peers were seen to increase in course of the intervention. It is interpreted as positive impact brought about by the intervention.

Data Triangulation

Data collected through different sources and methods were triangulated to confirm the results. Data analysis from all three showed positive results; i.e., 3 tier systematic remedial classes proved to improve students' performance. The performance tests results indicated that there was general improvement in the score of individual students except for few cases where the score of the students have decreased due to unknown reasons. The analysis of attitudinal survey data revealed that students were satisfied and had positive learning attitude towards the remedial classes conducted. From the anecdotal records, it was observed that the students changed their learning behavior as they were encouraged and motivated to ask more questions and perform better in course of intervention.

Reflection

We were all excited at the very thought of being researchers. But excitement was short-lived due a second thought of daunting task ahead; action research on effect of remedial classes on student academic achievement. We believed that remedial classes have to be planned well with appropriate strategies that suit general learners. A team of seven teachers with different subject background collaboratively were involved in this action research. "So, what are we going to do?" We selected one of the classes that we were teaching, especially from class ten and twelve. Initially some of us were not confident in the research process. However, our doubts were clarified after the presentation done by Cluster Lead Teacher who had attended a 5-day action research workshop conducted by REC.

We faced multiple challenges during the conduct of research. There were differences in the understanding of the process itself. Debates and discussions were part of daily meetings. Each debate took us a step forward in making each one of us professionally matured and competent. Many of us came across problems such as students not having interest, missing the remedial classes and lazy students. Some priority school activities also hindered the smooth flow of the action research process as well as the intervention. We observed that high achievers were very active and cooperative. However, the low achievers were least bothered and were reluctant to participate in the team discussions.

Since we were not able to achieve the objective of the action research that we started if things go as mentioned above, we changed some strategies in the middle. Initially remedial classes were taken after regular classes for a duration of 60 minutes using modified 3-tier intervention. So, to avoid above-mentioned problems, remedial classes were conducted in the morning before start of first period for 50 minutes. Besides, the sitting arrangement was also changed, each group consisting of two high achievers and rest low achievers in which the high achievers were made to sit diagonally to each other to facilitate effective peer tutoring. Each group had group leader appointed in rotation basis who coordinated progress of their group members. Assessment of the learners was done randomly in each group to keep every learner alert and attentive of what they were learning. This way we could give better remedial intervention to the students.

With every passing remedial class we could see the positive behavioral changes brought in participants towards learning. Peer tutoring and individualized attention strategies helped to improve interpersonal relationship between the teachers and the students, thereby boosting their confidence. Students were keen on learning the techniques of answering the different levels of questions which helped them to improve their scores. We felt students accepted the remedial program positively.

Eventually dawned on us that action research on any problem has two-fold benefits; benefit to teachers as researchers; professionally, and students as participants; academically. Free time, if any, could be used meaningfully On the other hand, since school is a busy place where teachers have to take up all sorts of responsibilities, it is hard to find meaningful timing for such research. We feel there should be extra support for teachers carrying out researches till such a time action research culture is institutionalized. However, we encourage others teachers to take up such action research.

Conclusion

This study employed a comparative analysis of pre- and post-test results to find out the effectiveness of remedial classes on class ten and twelve students' academic scores. Pre-test was conducted to determine the level of knowledge that the student possessed in unit/topics taught prior to the remedial classes. Post-test results showed how students responded to the 3-tier intervention targeted to affect students' performance through remedial classes. A separate cross sectional data was also collected from about 227 participants to measure individual attitude towards remedial classes and the manner in which remedial classes were conducted. The collected data were analyzed with the help of SPSS software into descriptive statistical inference.

The study concluded that a significant share of students responded positively to the intervention in all the subjects under study whereby increasing their scores. Although students in general performed better after the intervention, the impact has been less amongst the low achievers. This could be due to the short intervention time available for giving adequate practice to low achievers to write quality answers in those subjects. Therefore, it still validates that the remedial classes have positive effect on students' academic performance. The study, in particular, found that, out of many strategies, the 3- tier intervention worked well with the participants and the subjects in the study. From the Learning Satisfaction Survey result, more than 90% of participants strongly agree that the remedial classes were helpful and recommended such classes in future. It is also found from the anecdotal records and survey results that the students performed better due to quality time the teacher spent with the students. About 89% of students were found to be encouraged and motivated to participate in the team discussions and performed better as the teacher spent more time interacting with individual learner.

Three-tier remedial intervention can be applied in regular classroom teaching-learning to improve performance of low achievers in different classes in different subjects. It can be used as a part of everyday teaching strategy by every teacher after conducting professional development programs on it.

Limitation and Recommendation for Further Study

The major limitation of this research is inadequate data. The study could have been more reliable if intervention period was longer and sample size was larger. Further, testing on limited subjects cannot authenticate the positivity of such intervention in other subjects. Teacher's willingness to stay longer duration for intervention without additional incentives may also deter them from practicing the strategies mindfully. For better results, the future researchers are recommended to have longer intervention period with adequate support system for our teachers. They are also advised to roll out the strategies to all the teaching subjects to measure how individual subjects respond to the 3-tier intervention. Future researchers are also suggested to extend their study to other levels without prioritizing the students appearing for board examination. There is a scope of further research involving parents in students' academic support.

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