# School-Based Intervention for Academic Achievement: Targeting Cognitive, Motivational and Affective Factors

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*Abstract*—Outcome in any learning process should target three goals – propelling the underachiever's engagement in the learning process, enhancing the drive to achieve, and modifying attitudes and beliefs in his/her capabilities. An intervention study with a three-pronged approach incorporating self-regulatory training targeting three categories of strategies – cognitive, metacognitive and motivational – was designed adopting the before and after control-experimental group design. The evaluation of the training process was based on pre- and post-intervention measures obtained through three indices of measurement – academic scores based on grades on school examinations and comprehension tests, affective variables scores and level of strategy use obtained through responses on scales and questionnaires, and content analysis of subjective responses to open-ended probes. The evaluation relied on three sources – student, teacher and parent. The t-test results for the experimental and control groups on the pre- and post-intervention measurements indicate a significant increase on comprehension tasks for the experimental group. Though statistically significant difference was not found on the school examination scores for the experimental group, there was considerable decline in performance for the control group. Analysis of covariance (ANCOVA) was applied on the scores obtained on affective variables, namely, self-esteem, personal achievement goals, personal ego goals, personal task goals, and locus of control. The experimental group showed increase in personal achievement goals and personal ego goals as compared to the control group. Responses given by the experimental group to the open-ended probes on causal attributions indicated a considerable shift from external to internal causes when moving from the pre- to post-intervention stage. ANCOVA results revealed significantly higher use of learning strategies inclusive of mental learning strategies, behavioral learning strategies, self-regulatory strategies, and an improvement in study orientation encompassing study habits and study attitudes among the experimental group students. Parents and teachers reported significant progressive transformation towards constructive engagement with study material and self-imposed regulation. The implications of this study are three-fold: firstly, strategies training (cognitive, metacognitive and motivational) should be embedded into daily classroom routine; secondly, scaffolding by teachers through activities based on curriculum will eventually enable students to rely more on their own judgements of effective strategy use; thirdly, enhanced confidence will radiate to the affective aspects with enduring effects on other domains of life as well. The cyclic nature of the interaction between utilizing one's resources, managing effort and regulating emotions forms the foundation for academic achievement.

*Keywords*—Academic achievement, cognitive strategies, metacognitive strategies, motivational strategies.

## I. INTRODUCTION

THE new world order is characterized by fast and attractive ways of disseminating knowledge, and classrooms are encountering tremendous challenges warranting new approaches to teaching and learning. In this rapidly changing scenario, where the role of teachers is diminishing and the focus is on the new-age classrooms equipped with a combination of traditional pedagogy and self-directed knowledge-acquisition based on digital media, there are many challenges to be addressed, both at the teacher-training as well as student-learning levels.

Traditionally the classroom text materials were considered to be the most viable option for gaining academic knowledge. But today, the best educational system is the one that integrates textbooks, educational websites, and media. Juggling between these sources of knowledge acquisition places high demands on time management and application of learning skills. Competence emanates from skillfully filtering and utilizing relevant information in the limited timeframe allotted in any given educational setting.

Year after year, across the world, the emphasis laid on academic achievement is skyrocketing without realizing the pressure and stress it is creating in the students and taking a toll on their mental and physical wellbeing. When the criteria for competence are the examination performance scores alone and when its implications on self-esteem and sense of self-efficacy are ignored, many students who are not able to achieve the benchmark of potential laid down by external agencies like teachers, parents and society, begin to undermine their capabilities and are in danger of long-term personal degradation and low motivation.

The earlier educational reform movements emphasized on the role of teachers and parents as important agents in framing an instructions-based system of teaching and training catering to the differing needs of students from varied backgrounds including mental abilities, educational achievement standards, economic status, and socio-cultural contexts. With the easy availability of knowledge in today's highly technologically driven world, students from all backgrounds are able to design and supplement their educational experiences as per their personal interest and potential. Thus, the teachers and parents are getting increasingly aware that in the dyadic social relation between the student and the teacher, the role of the teacher is

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diminishing and a gradual release of control from the teacher to the student is essential. The question that needs to be addressed is: to what extent are students ready for dissociation from teacher-based instructions?

Underachievement which results in a tremendous waste of human potential in the country, is a pervasive problem even among most able students. Since educational failure is cumulative, it is important that underachievement is detected as early as possible, preferably during the early school years. Identification of underachievers and the modus operandi to be adopted to reverse underachievement issues in schools need a redressal. Encouraging active self-regulation in the direction of a set goal, propelled by intrinsically generated motivation and intentional actions is the answer to achievement. Often such regulation may initially need a push from the outside by more competent people.

Self-regulation is the pivot for any achievement and is characterized by self-determination directed toward the use of strategies apt for a given situation. It involves the integration between knowledge of specific strategies, metacognition and motivational processes [1]. When encountering any learning task, knowledge of cognitive-learning strategies alone does not ensure its effective use. The important prerequisite for efficient use of strategies is self-motivation to monitor, persist and evaluate the amount of effort required and the direction of outcomes [2], [3]. Motivation drives one to identify the situations where strategies need to be applied and the desire to utilize them for the purposes of learning and retention of study material [4]. It has been established that achievement outcomes comprise of two essential components, i.e., skill and will [5], and the presence of one of these alone will not ensure success.

### A. Learning Strategies: Cognitive and Metacognitive

The effectiveness of learning strategies is dependent on the integration of two skill components – the basic cognitive strategies and the higher order metacognitive strategies [6]. Micro-level cognitive strategies are specific and executive in nature, while macro strategies are more elaborate and metacognitive in character. Mental activities engaging strategies that select and organize information, rehearse and categorize acquired knowledge, and retain and retrieve data as and when required are generally referred to as micro-level *cognitive strategies* [7]. Learning strategies directly applied and utilized in an academic learning task are to be understood independently. However, for learning achievement to be optimized, outcome prediction and outcome monitoring are more important than the basic application of strategies [8]. This can be accomplished through the process of 'learning to learn', also referred to as *metacognitive strategies*. The knack of applying metacognitive strategies to learning contexts requires a skill that can be acquired and improved only through continuous practice of multiple cognitive strategies. Once the students gain competence in the application of cognitive skills, the strategies take on metacognitive characteristics wherein the control over thinking and learning activities move from conscious and voluntary effort to effortless application.

### B. Motivational Strategies

Motivational control skills are adopted only when one is driven by an intrinsic desire to achieve goals. Engaging in activities such as interim goal setting and goal visualization that maintain attentional control, as well as adopting strategies that are directed to understanding the requirements of the task at hand, are just a couple of motivational strategies employed by achievers [9]. In the initial stage of skill development, attentional effort is directed to understanding the requirements of the task at hand. After the minimal acceptable or satisfactory level of performance has been acquired, i.e., in the later phases of skills acquisition, motivational skills play a significant role in sustaining interest in the activity [10]. Once a level of interest in the task has been attained, the individual continues with the task because of the intrinsic value it provides, either of satisfaction or as attractive challenge, and not because the task has been imposed on by external agents.

### C. Affective Characteristics

Early childhood experiences including formal learning and its outcomes set the stage for the development of an eagerness to engage or to not engage in learning activities. Students' affective dimensions are in part the result of the histories of their successful or unsuccessful achievements, and the feedback they could garner for that pattern [11]. Students who are generally successful develop positive affective characteristics while those who experience failure, do not [12], [13]. In turn these affective outcomes of learning become the affective entry characteristics in the initiation of new learning tasks.

With the view that the ultimate goal of education is to provide the student with life-long self-learning skills that help enhance his/her knowledge and affective aspects, this study was aimed at shifting to the student the onus of pursuing his own education. The outcomes of academics have to be sufficiently attractive to the students for them to be motivated to invest effort in it. Research has supported the fact that competence is best achieved through "hands-on" learning of skills, problem-solving techniques and analytical thinking [14]. Motivation is driven by competence, and competence propels achievement, attaining a cyclic dynamism [15]. In order to make lessons interesting and comprehensible, the present study aimed at providing the necessary strategies that would not only enhance understanding of text, but also increase the student's motivation and change his/her self-beliefs.

The present study is an attempt to assist the underachiever in developing appropriate self-regulatory strategies which include both motivational 'will' related strategies (goal setting, planning, self-monitoring, self-evaluation) and learning 'skill' related (cognitive - rehearsal, elaboration and organization; and meta-cognitive) and to assess its influence on (a) academic performance (examination scores and comprehension of text scores) (b) Affective variables (self-esteem, personal achievement goals, locus of control) (c) Use of learning strategies and study orientation.

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## II. METHODOLOGY

### A. Design

The before-after, experimental-control group design was adopted to study the effectiveness of a strategies training intervention program targeting underachieving students. Pre-training scores were obtained to help assess the baseline of the experimental and the control groups on the dependent variables (academic performance, comprehension scores, self-esteem, personal achievement goals, locus of control, use of learning strategies, and study habits and orientation). While both groups attended regular conventional classroom lessons, the experimental group participated in an additional strategies training program for a duration of five months with sessions held at regular intervals. Post-training assessments on the dependent variables were conducted on both the groups.

### B. Sample

Sample of 60 underachieving seventh graders were selected on the basis of class performance, IQ scores and in consultation with the teachers and parents from schools that matched on the syllabus content, demographic context and achievement data. The control and experimental group comprised of 30 students each. Sample size was kept intentionally small as the intervention required intensive training for each student on a one-to-one basis.

### C. Assessment Measures

Raven's Progressive Matrices [16] and school year end examination results were used to identify underachieving students who were within the criteria of having average/above average IQ score and obtaining below class average scores on year end examination. Comprehension tasks (comprehension passages were selected in consultation with the teachers of the seventh-grade) helped in providing the baseline score before strategy training was initiated as well as a means for post-intervention assessment.

Affective variables were measured using multiple scales. Rosenberg's Self-esteem Scale [17] assessed the degree of favorable or unfavorable attitude towards oneself, generally considered as the evaluative component of self-concept; Personal Achievement Goals Scale [18] consisting of two subscales measured personal ego goals and personal task goals; Nowicki – Strickland Locus of Control Scale [19] reflected the belief in one's ability to control life events; and two open-ended questions on casual attributions [20] were used for obtaining subjective data.

Strategies use was measured using the Learning Strategies Questionnaire [21] consisting of three subscales, namely, Mental Learning Strategies, Behavioral Learning Strategies and Self-regulatory Strategies; and the Survey of Study Habits and Attitudes [22] provided an extensive measure of planning, execution and monitoring of effort in study routine.

Finally, keeping in view that the best observers of the students are their teachers and parents, a rating schedule prepared by the investigator for teacher and parent assessments was also utilized.

## III. RESULTS

### A. Academic Scores

T-test computed on the pre- and post-intervention measurements of the control and experimental groups on comprehension task indicated a significant increase in scores for the experimental group. Although, the grades obtained in term of percentages on school examinations do not indicate any statistically significant difference for the experimental group, the results point to a significant decrement in the examination results of the control group (Table I).

TABLE I
MEAN, SD, AND T-VALUES FOR DIFFERENCE BETWEEN THE PRE-TRAINING AND POST-TRAINING SCORES

| Academic Measures | Pre-Training | | | Post-Training | | | $T$ |
|---|---|---|---|---|---|---|---|
| | M | SD | N | M | SD | N | |
| Percentage marks | | | | | | | |
| Control Group | 47.42 | 6.76 | 30 | 42.87 | 8.87 | 30 | 4.42*** |
| Experimental Group | 45.13 | 6.37 | 30 | 43.37 | 7.19 | 30 | 1.6 |
| Comprehension Task Scores | | | | | | | |
| Control Group | 4.8 | 1.95 | 30 | 6.27 | 1.51 | 30 | -1.77 |
| Experimental Group | 4.97 | 1.63 | 30 | 8.67 | .96 | 30 | -8.37*** |

Note: * = $p < .05$, ** = $p < .01$, *** = $p < .001$

*Percentage of marks obtained on examinations* indicate a significant difference between the pre-training and the post-training scores of the control group with $t(58) = 4.42$, $p < .001$. The pre-training mean score of 47.42 for the control group shows a decline to 42.87 at the post-training stage, indicating a decrease in the percentage of marks obtained on the seventh-grade final examination as compared to that of sixth-grade results. No significant difference is found between pre- and post-training scores of the experimental group.

Analysis of the *comprehension task scores* of the experimental group shows a significant difference between the mean scores obtained on the post-training stage as compared to the pre-training stage with $t(58) = -8.37$, $p < .001$. Considering the fact that the total score obtainable on the comprehension task was 10, there is a significant increase for the experimental group from a mean score of 4.97 to a post-training score of 8.67. In case of the control group there is no significant difference in the magnitude of increase from pre-training to post-training stage.

### B. Affective Variables

Scores obtained on measures assessing affective variables, i.e., self-esteem, personal achievement goals, personal ego goals, personal task goals, and locus of control were subjected to ANCOVA (Table II).

For *personal achievement goals*, ANCOVA results, $F(1, 57) = 6.29$, $p < .05$, indicate that there exists a significant difference on the post-intervention scores of the two groups, with the experimental group (M = 40.63, SD = 6.59) showing a significant increase in achievement goal levels and the control group (M = 37.40, SD = 6.59) showing a decline. In addition, ANCOVA indicated that the students of the experimental group had significantly higher post-intervention values (M = 20.43, SD = 3.68) on *personal ego goals* than did controls (M = 16.90,

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SD = 4.95) after controlling for pre-treatment levels, F(1,57) = 10.21, p < .001.

Interestingly, even though statistically significant differences were not obtained on self-esteem, personal task goals, and locus of control, content analysis of the responses to the open-ended probes given by the experimental group indicated a considerable positive shift from pre- to post-intervention stage.

TABLE II
ANCOVA RESULTS FOR CHANGE IN AFFECTIVE VARIABLES

| Measure | Pre-training | | | | | Post-training | | | | | ANCOVA (1,57) |
| | Treatment group | | Control group | | ANOVA (1,58) | Treatment group | | Control group | | ANOVA (1,58) | |
| | M | SD | M | SD | | M | SD | M | SD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SE | 31.70 | 4.45 | 33.07 | 5.90 | 1.03 | 31.27 | 4.46 | 33.90 | 6.91 | 3.08 | 1.98 |
| PAG | 36.97 | 7.55 | 40.73 | 7.82 | 3.60 | 40.63 | 6.59 | 37.40 | 6.59 | 3.00 | 6.29* |
| - PEG | 17.63 | 4.39 | 18.13 | 4.78 | < 1 | 20.43 | 3.68 | 16.90 | 4.95 | 3.91* | 10.21*** |
| - PTG | 19.33 | 4.41 | 22.60 | 4.30 | 8.46** | 20.20 | 4.28 | 20.50 | 5.14 | 0.06 | .93 |
| (i) OC | 18.13 | 3.77 | 18.13 | 3.35 | < 1 | 16.47 | 3.70 | 17.87 | 3.84 | 2.07 | 2.27 |

Note: SE = Self-esteem, PAG = Personal Achievement Goals (Total), PEG = Personal Ego Goals, PTG = Personal Task Goals, LOC = Locus of Control
. ANOVA = Analysis of Variance

TABLE III
ANCOVA RESULTS FOR CHANGE IN STRATEGY USE

| Measure | Pre-training | | | | | Post-training | | | | | ANCOVA (1,57) |
| | Treatment group | | Control group | | ANOVA (1,58) | Treatment group | | Control group | | ANOVA (1,58) | |
| | M | SD | M | SD | | M | SD | M | SD | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS | 145.60 | 20.44 | 147.93 | 30.46 | < 1 | 161.93 | 22.81 | 137.33 | 27.51 | 14.21*** | 21.95*** |
| - MLS | 49.13 | 8.22 | 49.10 | 10.01 | < 1 | 55.30 | 9.22 | 46.03 | 8.08 | 17.14*** | 21.24*** |
| - BLS | 48.57 | 7.73 | 50.37 | 11.09 | < 1 | 54.57 | 8.25 | 44.70 | 10.68 | 16.03*** | 23.72*** |
| - SRS | 47.90 | 7.35 | 48.47 | 11.80 | < 1 | 52.07 | 7.7 | 46.27 | 10.25 | 6.12* | 9.35*** |
| SO | 88.87 | 28.56 | 96.00 | 29.52 | < 1 | 107.50 | 29.39 | 94.17 | 32.14 | 2.81 | 10.48*** |
| - SH | 40.67 | 13.58 | 46.53 | 15.64 | 2.4 | 49.17 | 17.22 | 44.00 | 15.94 | 1.46 | 9.22*** |
| - SA | 48.20 | 17.78 | 49.47 | 17.06 | < 1 | 58.33 | 15.12 | 50.10 | 17.74 | 3.74 | 8.09*** |

*C. Learning Strategies Scores*

Analysis performed on the post-intervention scores of the experimental and the control groups, with pre-intervention scores as the covariate to assess training effect also revealed significantly higher use of learning strategies that included mental learning strategies, behavioral learning strategies, self-regulatory strategies, and a definite improvement in study orientation including study habits and study attitudes among the experimental group students (Table III).

The results indicated that the experimental and the control groups did not differ significantly in the *use of learning strategies* prior to the training and were therefore matching on their baseline measures. ANCOVA result indicated that the post-training scores of the two groups differ significantly, *F* (1, 57) = 21.95, *p* < .001. The experimental group participants reported significantly higher use of learning strategies (*M* = 161.93, *SD* = 22.81) than did the controls (*M* = 137.33, *SD* = 27.51). Similarly, on each of the subscales - Mental Learning Strategies, Behavioral Learning Strategies, and Self-Regulatory Strategies – the experimental group scored significantly higher use.

The post-training scores also exhibited a significant difference between the groups, *F* (1, 57) = 9.22, *p* < .001 on *study habits*. Those in the experimental condition (*M* = 49.17, *SD* = 17.22) reported better study habits than did the controls (*M* = 44.00, *SD* = 15.94) at post-intervention. Significant group difference was also found in the *study attitudes* at post-training, F(1,57) = 8.09, *p* < .01, with students assigned to the experimental condition (*M* = 58.33, *SD* = 15.12) reporting more positive study attitudes than those in the control condition (*M* = 50.10, *SD* = 17.74).

*D. Content Analysis of Qualitative Data*

Even though statistically significant differences were not obtained on self-esteem, personal task goals, and locus of control, content analysis of the responses given by the experimental group to the open-ended probes indicated a positive shift. Similarly, the post-intervention stage responses related to casual attributions also indicated a shift from external attributions to internal factors being recognized as factors responsible for achievement.

Teacher and parent assessments brought out various positive changes in motivation, oral participation in class, improvement in written assignments, regularity in class, attention control, time and effort spent in studying, increased sociability, interest in extra-curricular activities, etc.

IV. DISCUSSION

Direct in-depth instructions and guided application of strategies with discussions on motivational orientations, cognitive strategies and metacognitive coordination of strategy use created an awareness that appropriate techniques are available to enhance academic achievement. Strategies training brought a shift in perception of personal achievement goals. These results suggest that students developed a strong sense of efficacy towards academic tasks to be able to set personal goals.

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Since academic self-efficacy has the innate characteristic of generalizability to other domains of life, successfully acquiring a cognitive skill induces in students a feeling of confidence in confronting tasks of similar nature, and this enhances their sense of personal competence. Change in the students' goal orientations served as a mediator in determining the extend of change in the behavioral, cognitive and affective patterns in achievement situations, and was a determinant in the increased use of learning strategies. Improvement in study habits and attitudes as well as increased use of learning strategies is indicative of higher motivation levels. For self-regulation and discipline to be instilled in one, the individual needs to expect a sense of satisfaction or some positive output. Even though no significant change was observed in academic performance following training, comprehension results exhibited considerable improvement in the understanding of text material as indicated in through the results.

Strategies training provided scaffolding to the learning process. With active discussions between the researcher and the students fostering appropriate strategies selection resulted in better learning outcomes. This enhanced the motivation level in the students instilling in them the 'will' to set challenging yet attainable goals and to apply the 'skills' with the aim to succeed in spite of the increased effort they had to put into the learning situation. At the end of the training, with increased intrinsic drive, students learnt to exercise volitional control on themselves to avoid distractions and stay focused on the task at hand. With better management and predictability of outcomes, their self-esteem gains a boost [23].

A mutually enhancing cycle of 'skill' and 'will' got triggered as training progressed, confirming that the loop between cognition, motivation, and affect is essential in self-regulated learning. In their research findings on achievement-oriented learning [24] reports that for students to be academically adept they need to have both the 'will' and the 'skill'. Increments in success lead to increments in efficacy beliefs, and these together bring a change in the outlook towards learning characterized by intrinsically driven interest.

Self-regulatory strategies training in the present research led to various key findings:

- *First*, the student is the most powerful force in the dynamics of academic achievement. The responsibility for reversal of poor performance falls largely on the students' drive to achieve. In the absence of 'will', acquiring 'skill' alone will not bring any changes.
- *Second*, students need to be provided with the knowledge of the rich variety of strategies that they can use on academic tasks. This will include information and guidance on the use of strategies, like how, when, and why to apply specific strategies to specific learning contexts.
- *Third*, it is important that frequent opportunities are created by the teacher to practice the strategies in authentic learning activities, and as far as possible embed them in daily classroom routine as part of the curriculum.
- *Fourth*, students' belief in the strategies as the reason for success plays a crucial role in the use or non-use of the strategies. If the students attribute success to personal stable factors like one's own intelligence and ability or to less controllable causes such as luck and the teacher biases, they are less likely to utilize effective strategies in the future.
- *Fifth*, successful application of strategies in specific situations sets the stage for transference of learning to other domains of learning. The self-regulatory aspect of training gets infused into managing one's effort, resources, and emotions in general.
- *Sixth*, and the most important of all, these strategies enhance the affective (non-cognitive) aspects of the individual which have an enduring and long-term effect that radiate to all other spheres of their life.

## V. CONCLUSION

The findings of the current study suggest that a student must have acquired knowledge regarding strategies that can be applied to a given academic task in order to gain understanding and to succeed. Though in the context of technology today, one would like to conclude that self-exploration will help the students, it is still imperative for a teacher to provide direction in the application of specific cognitive strategies to specific contexts and materials of academic study. The information on internet is too vast for the student to accurately identify, grasp and apply to specific classroom contexts. Students' knowledge of cognitive, meta-cognitive and motivational strategies, which is rarely recognized as an essential element of curriculum formation, should be integrated not only into the monitoring and assessment of student progress in learning but also into instructional planning for teacher trainees. In addition to empowering students with the knowledge of strategies to succeed, the goal of education should be to nurture the belief in their potential for higher levels of achievement that would be also with accompanied with a sense of fulfilment.

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