

Abstract

The aim was to study the Effect of Self-Directed Learning Programme on Secondary School Students' Academic Achievement. An experimental method of the pre-test and post-test non-equivalent group design was used. The sample selected consisted of standard IX students from Marathi medium (Semi-English) schools of Mumbai. The total sample was 52 students, 30 in the experimental group and 22 students in control group. Data collected was analyzed using parametric tests i.e. t-test, ANCOVA and ω^2 . Findings of the study revealed that the Grow's Self-Directed Learning Model (Self-Directed Learning Program) approach was effective in developing Academic Achievement.

Introduction

One of the most primordial requirements for the development of mankind is education. It is the greatest catalyst for rapid and exponential growth in national and societal development. Education brings about enrichment not only in terms of an individual's physical lifestyle but also mental and behavioral well-being. The focal point of the educational process is the student. If student's learning needs are fulfilled effectively, then we can talk about our nation's future confidently. Therefore in an educational process a student's learning strategies are essential. In India education is based on an instructional mode on which the student is dependent.

Establishing a structure where a student is encouraged to set up self-directed learning is essential. Ekalavya from the epic Mahabharata is an example of a self-directed learner. Ekalavya took complete responsibility of his learning and achieved mastery in archery. Therefore self-directed learning is an important aspect of today's educational process and it needs to be taken into consideration.

Science is a systematic study of knowledge and it is tentative, dynamic, empirically verifiable, process and product, science is a way of knowing about the natural phenomena.Revolution of science and technology has glorified the modern world in various

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ways. In fact, this revolution is the most important among the different newly emerging issues in the contemporary society. This has transformed the modern civilization into a scientific civilization. In this context, science has become an integral part of our life and living. It is no longer confined to the eminent scientists. Rather, knowledge of science of an individual has become almost essential irrespective of his/her status. It is also considered as an important quality parameter of a school learner, in particular.

Sound achievement in science does not only build the pillars on which the future success of an individual depends, it also provides him a scope to contribute significantly for the progress of nation.

Self-directed Learning

Most adults spend a considerable time acquiring information and learning new skills. The rapidity of change, the continuous creation of new knowledge, and an ever-widening access to information make such acquisitions necessary. Much of this learning takes place at the learner's initiative, even if available through formal settings. A common label given to such activity is self-directed learning.

Learning has undergone a massive change throughout the last two centuries "Learner's Autonomy" has become an unquestionable goal and integral part of teaching methodologies in the contemporary "learner centric" education literature. Self-directed Learning (SDL) is one of those tools with the cause to respect learner's sovereignty. Individuals take initiative and responsibility for learning. Individuals select, manage, and assess their own learning activities. Motivation and volition are critical. Independence in setting goals and defining what is worthwhile to learn. Teachers provide scaffolding, mentoring, advising and peers provide collaboration are the aspects of self-directed learning. The students are motivated, persistent, independent, self-disciplined, self-confident and goal oriented are the positive outcomes of self-directed learning.

Gerald Grow's Staged Self-directed Learning Model

There is no one good way to manage everyone, yet everyone can be managed in such a way that they increase in the ability to be more self-managing.

Students have varying abilities to respond to teaching that requires them to be selfdirecting. Based on Situational Leadership model of Hersey and Blanchard (1988), the staged self-directed learning model (Fig.1) proposes that student's advance through stages of increasing self-direction and those teachers can help or hinder that development.

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	Student	Teacher	Examples	
Stage 1	Dependent	Authority,	Coaching with immediate feedback. Drill.	
		Coach Informational lecture. Overcomi		
			deficiencies and resistance.	
Stage 2	Interested	Motivator,	Inspiring lecture plus guided discussion.	
		Guide	Goal-setting and learning strategies.	
Stage 3	Involved	Facilitator	Discussion facilitated by teacher who	
			participates as equal. Seminar. Group	
			projects.	
Stage 4	Self-Directed	Consultant,	Internship, dissertation, individual work or	
		Delegator	self-directed study-group.	

Figure 1: The Staged Self-directed Learning Model

Figure 1 introduces the four stages of staged self-directed learning model which are inspired by the four leadership styles described in Situational leadership.

Grow's Staged Self-directed Learning Model teaches students to be self-directed. Good teaching matches the students stage of self-direction helps the learner advance toward greater self- direction. Staged self-directed learning model suggests how teachers can actively equip students to become more self-directed in their learning. The fundamental movement implicit in the Staged Self-directed Learning Model is the moment from dependent to self-directed learning. Teaching is matched to the students with the explicit purpose of helping them attain the knowledge, skills, motivation and goal of becoming more autonomous in learning and in life.

Though Grow's model emphasizes on adult learning in 19th century but with current generation it is of an equal importance at all stages of life.

Academic Achievement

Trow (1956) defined academic achievement as "knowledge attaining ability or degree of competence in school tasks usually measured by standardized tests and expressed in a grade or units based on pupils' performance". Good (1959) refers academic achievement as, "The knowledge obtained or skills developed in the school subjects usually designed by test scores or marks assigned by the teacher".

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Academic achievement in adolescence is a key determinant of an individuals' future educational as well as occupational success and subsequently the individuals' progress.

Besides the relevance for an individual, academic achievement is of utmost importance for the wealth of a nation and its prosperity. The strong association between a society's level of academic achievement and positive socioeconomic development is one reason for conducting international studies on academic achievement, such as PISA (Programme for International Student Assessment), administered by the OECD (Organization for Economic Co-operation and Development). The results of these studies provide information about different indicators of a nation's academic achievement; such information is used to analyze the strengths and weaknesses of a nation's educational system and to guide educational policy decisions.

NEED FOR THE STUDY:

The structure of the learning system favors a learner centered approach. The students are exposed to a plethora of knowledge in multiple disciplines. The ratio of students to teachers in the country is very high. With vast curriculum and inclusive education; students with different IQs, psycho-social backgrounds, learning abilities, learning pace, learning styles, creativity, and interest also study in a class under one roof. This makes difficult for the teachers as well as students to attain educational goals. For positive outcome teacher should, with our education system, update students regularly and overcome all these problems. So as to smoothen the teaching learning process and for better academic achievement followed by greater productivity self-directed learning is one of the methods which may bring about the necessary change.

The goal of educational process is to produce self-directed, lifelong students is believed by Gerald Grow (1991). Self-directed learning has gained importance in recent times as a critical attribute for lifelong learning in order to survive in an environment profoundly influenced by economic, technology and social changes. Knowles predicts that by year 2020, all learning will be based on principles of Self-directed learning. Grow suggests a staged model of transition from a dependent to self-directed learner. With his model he proposes a way teachers can be vigorously influential while empowering students towards greater autonomy.

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The staged self-directed learning model provides a frame work to aid good teaching practice by matching the teaching style to the learner's stage of self- direction. The appropriate teaching style can help the learner advance towards greater self-direction. The Staged Self-directed learning model is a planning tool for teachers to think about their learner's stage of Self direction and match their teaching style to support development to greater self-direction.

Researcher is in the field of education and teaching science to the secondary school students for past twenty two years. While teaching Science the researcher found that the students are curious if the subject is taught in an interesting manner. In order to make the topic meaningful and interesting to the students the researcher decided to use the Self directed learning model as the model provides a frame work to aid good teaching practice by matching the teaching style to the learner's stage of self- direction. Self directed learning enables the learner to develop deeper understanding of the concept which is necessary as science is a subject which is beyond the curriculum and involves lifelong learning.

Also, from the reviews it was found that all the studies on SDL are conducted abroad and very few researches are found to have been conducted in India. Therefore, the researcher was interested in conducting an experimental study on students of standard IX. The revised syllabus on the guidelines of National Curriculum Framework (NCF) 2005 also emphasizes that the teachers should facilitate children in developing science processing skill. Thus considering the factors described above, one can say that there was a need to conduct a study on the said topic.

AIMS OF THE STUDY:

The study was undertaken with the following broad aims

1. To develop a self-directed learning programme based on Grow's staged self-directed learning model for teaching science to secondary school students.

2. To study the effectiveness of self-directed learning program based on Grow's staged selfdirected learning model on Academic Achievement among secondary school students.

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OBJECTIVES OF THE STUDY:

The following objectives were formulated as per the variables of the final study

- 1. To study and compare the pre-test scores of the students' Academic Achievement for experimental and control group
- 2. To develop self-directed learning programme based on Grow's staged self-directed learning model by constructing activity plans and conducting activities for the students of standard IX of experimental group in science.
- 3. To study and compare the post-test scores of the students' Academic Achievement for experimental and control group
- 4. To study and compare the gain scores of Academic Achievement for experimental and control groups
- 5. To estimate the effect size of the treatment on the experimental group forAcademic Achievement
- 6. To compare the pre and post-test scores of the students' Academic Achievement for experimental group
- 7. To compare the pre and post-test scores of the students' Academic Achievement for control group

OPERATIONAL DEFINITIONS FOR THE STUDY:

1. Self-directed Learning Programme

It is a programme based on Grow's Four Stage Self-Directed Learning Model where students of standard IX move from Dependent (stage:1) to Interested(stage:2), Interested(stage:2) to Involved(stage:3) and Involved(stage:3) to Self-Directed(stage:4), acquire Science Process Skills, develop Scientific Attitude and achieve highest Academic Achievement in Science. By using Grow's staged self-directed learning model the teacher matches his/her learning style with the students' stage of self-direction that helps the students to advance towards greater self-direction.

2. Academic Achievement

Academic Achievement for the present study comprises the Science test scores of standard IX students where the test is designed by science teachers of the school.

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DESIGN OF THE STUDY:

Methodology: For the present study the researcher has used pre-test post-test nonequivalent group quasi-experimental design. A treatment was given to experimental group and no treatment to the control group. The difference of the mean of the pre-test, post test scores were tested for statistical significance for both experimental and control groups.

- **Sampling:**The sample selected consisted of standard IX students from Marathi medium (Semi-English) schools of same socioeconomic status and from the nearby locality. The total sample was 52 students, 30 in the experimental group and 22 students in control group.
- **Tools of Research:** The researcher used the science scores obtained by the standard IX students in their school test. The test was prepared by science teachers of the school. The SSC board pattern and syllabus is used while setting the tests.

Data Analysis Techniques:Descriptive method was used to describe the data in terms of mean, standard deviation, bar graph, pie chart and in the inferential method parametric tests i.e. t-test, ANCOVA and Wolf's Formula were used for testing of hypothesis.

MAJOR FINDINGS AND DISCUSSION:

1. There is a significant difference in the pre-test scores of Academic Achievement of the students in experimental group and control group (Table 1)

Table 1
Differences in Pre -Test Scores of Academic Achievement
for Experimental and Control Groups

Variable	Group	N	Mean	SD	t-ratio	Level of Significance
Academic	Experimental	30	54.4	12.14	3.02	0.01
Achievement	Control	22	43.27	16.08	5.02	0.01

Academic achievement is considered as a key criterion to judge one's total potentialities and capabilities.Researcher is teaching science in the school for past thirteen years. Experimental group is selected from the same school where researcher is teaching. As per the guidelines given by National Curriculum Framework 2005, the researcher was already making use of updated instructional materials and application of new trends in education such as interactive methodologies as guest lecture, case studies, stress on quality above quantity, action research project method and innovative teaching learning strategies namely activity based student centered learning, use of ICT. This might have helped experimental group students to perform better than the control group students in the pre-test.

2. There is a significant difference in the post-test scores of Academic Achievement for the students of experimental group and control group. ANCOVA is used to test this hypothesis

Table 2

Differences in Post-Test Scores of Academic Achievementfor Experimental and
Control Groups

Variable	Group	N	Mean	SD	F-ratio	Level of Significance
Academic	Experimental	30	54.87	13.44	42.2	0.01
Achievement	Control	22	28.95	11.65	.2.2	0101

Table 3						
Adjusted Mean Scores of Academic Achievement for						
Experimental and Control groups						

Group	Observed Mean	Adjusted Mean
Experimental	54.87	52.12
Control	28.95	32.70

After the implementation of Grows's Staged Self-Directed Learning Model andas a part of the programmeExperiential Learning, Project Method, Flip Classroom, Critical Thinking Problem Solving, Advance Organizer and Peer Tutoring techniques were followed. A significant difference was seen in the post-test scores. This may be due to the following reasons:

• Empirical evidences indicate that there is a correlation between self-directed learning and academic achievement. Carson (2012), self-directed learning and personality traits are correlated and that self-directed learning predicts academic achievement. Cazan and Schiopca (2014) also there exist a positive relationship between academic achievement and classroom environment among adolescents. Benipal and Singh (2014)

• Before the implementation of Grows's Staged Self-Directed Learning Model, the level of self-direction for the sample was checked and it indicated higher for the experimental group than the control group. This initial, higher Self-Directed Learning and Academic Achievement in the pre-test must have helped experimental group students to increase their academic achievement and perform better in the post-test.

• In course of implementation of Grows's Staged Self-Directed Learning Model Experiential Learning, Project Method, Flip Classroom, Critical Thinking Problem Solving, Advance Organizer and Peer Tutoring techniques were followed as a part of the programme. Thismust have helped experimental group in enhancing the Academic Achievement than the control group.

• As with the greater Self-Directed Learning in the pre-test, the experimental group students were both, able and willing to take responsibility for their learning, direction and productivity. They exercise skills in time management, project management, goal-setting, self-evaluation, peer critique, information gathering, and use of educational resources. They thrived in an atmosphere of autonomy. Some learners become situational self-directed while some become self-directed in a more general sense. Though the learners were with high self-direction, their learning does not completely do away with teachers. As Candy (1987) puts it, "There are certain skills and other bodies of knowledge which are best and most easily mastered under the tutelage of an expert". Researcher at this stage was a delegator.

• As the experimental group learners at this stage were with high in Self-Directed Learning and Academic achievement, their basic concepts of the content must be strong on which further knowledge, understanding, applications and skills was built. This must have helped them for the better post-test Academic Achievement than the control group.

• Researcher applied looping a more effective way to administer the Grows's Staged Self-Directed Learning Model at times than trying to follow sequence of linear stages which must have helped experimental group students to enrich their Academic achievement than the control group in the post-test.

3. There is no significant difference in the pre and post-test scores of students' Academic Achievement for the experimental group(Table 4)

Table 4

Differences inPre and Post-Test Scores of Academic Achievement for Experimental Group

Variable	Teat	N	Af	Maan	SD.		t-	Level of	
variable	Test	IN	ui	Mean SD	I	ratio	Significance		
Academic	Pre	30	29	54.4	12.14	0.70	0.26	Not	
Achievement	Post	50	2)	54.87	13.44	0.70	0.70	0.20	Significant

• Initial pre-test resultsshow, the experimental group learners were at high Self-Directed Learning which enabled their teacher, researcher to be a facilitator or delegator than authority coach or motivator. Being high on self-direction, learners were allowed to work individually or Self-Directed study group. The teaching strategies used were accordingly, for e.g. experiential learning, project method, critical thinking and problem solving, flip classroom, advance organizer, peer tutoring which might have taken the learners out of syllabi and more exposure to the knowledge. This might have improved learner's quality of education than the quantitative marks. None of the experimental group student was below minimum passing marks for pre and the post test. The average score of the experimental group for the pre-test was 68% and for the post-test 68.58% which indicates students are capable of maintaining the first class.

4. There is a significant difference in the pre and post-test scores of students' Academic Achievement for the control group (Table 5)

Table 5
Differences inPre and Post-Test Scores of Academic Achievement for Control Group

Variable	Test	N	df	Mean	SD	r	t-ratio	Level of Significance
Academic	Pre	22	21	43.27	16.08	0.60	5.15	0.01
Achievement	Post	22	21	28.95	11.65	0.00	5.15	0.01
	•							

• Pre (43.27) and post-test (28.95) mean scores for the control group indicate a very high drop in the Academic Achievement and subsequently the learning outcomes.

• Initially in the pre-test, only 3 students of the control group failed to get the minimum passing marks. In the post test the number of failures further increased to 11. The average score of the control group for the pre-test was 54.09% and for the post-test it dropped down to 36.19%.

• This decrease in the average percentage as well increase in the number of failures of the control group may be due to the teachers' as well as students' ignorance towards the academic achievement and subsequently the achievement of the educational goals.

• Though in the post-test, control group showed remarkable increase in the Self-Directed Learning scores, their decrease in the academic achievement post-test scores indicate that their Self-Directed Learning should be further refined towards goal orientation in education or should be acquired by the Grows's Staged Self-Directed Learning Model for better productivity.

5. There is a significant difference in the gain scores of Academic Achievement for experimental and control group (Table 6)

Table 6

Differences in Gain scores of Academic Achievementfor Experimental and Control Groups

Variable	Group	N	Pre Test Scores	Post Test Scores	Gain Scores	Gain Score SD	t- ratio	Level of Significance
Academic	Experimental	30	54.4	54.87	0.47	10	4.45	0.01
Achievement	Control	22	43.27	28.95	-14.32	13.02		

Since the t- ratio of gain score of Academic Achievement is found to be significant and mean gain score of Academic Achievement for experimental group is found to be higher hence ω^2 estimate value is calculated using the formula. The following table 7 gives the ω^2 estimate value for the variable Academic Achievement. 100 x ω^2 indicates the percentage of variance in the variable Academic Achievement.

Table 7

ω^2 - estimate value for the variables Academic Achievement

Variable	t-ratio of Gain score	ω ²	100 ω ²
Academic Achievement	4.45	19.80	26.5%

From Table 7 it can be said that the Ω^2 estimate on variable Academic Achievement is Thus it can be inferred that Grow's self-directed learning model (Self-Directed Learning Programme) has helped in developingAcademic Achievement in the students of standard IX for experimental group.

6. Treatment was found to be effective in enhancing Academic Achievement for experimental group after the implementation Self-Directed Learning Programme.(Table8)

Table 8

 Effect Size of Treatment on Academic Achievement

 ident
 Mean of
 SD of
 Magnitude

Dependent	Mean of	Mean of	SD of	Magnitude	
Variable	Experimental	Control	Control	of the	Effect size
	Group	Group	Group	Effect	
Academic	52.12	22.70	11.65	1.67	Maximum
Achievement	52.12	32.70	11.05	1.07	Effect

Hence as per Wolf's criterion, the treatment was found to be of maximum effect in enhancing Academic Achievementof the students of standard IX in Science.

SUGGESTIONS BASED ON THE PRESENT STUDY:

- In-service courses and implementations should be done on the importance of Selfdirected Learning and Academic Achievement.
- Process of teaching and learning science that uses various teaching approaches in one science lesson should be used which will have additional advantages in terms of providing opportunities for the enrichment of the Academic Achievement.

- Teachers should execute the lesson plans prepared by using Gerald Grow's Staged Selfdirected Learning Model in their lessons to teach and improve students' Academic Achievement.
- Entire course should be planned using Gerald Grow's Staged Self-directed Learning Model to enhance Academic Achievement as well prepares students for self-direction and lifelong learning.
- To meet the future challenges in science, need of an hour is to develop Self-directed Learners. Grow's Four Stage Self-Directed Learning model should be used to move students from dependent to more Self-Directed Learning over a semester, to inflate scientific Knowledge, scientific attitude and to gain maximum output in terms of Academic Achievement.

CONCLUSION:

Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university. School systems mostly define cognitive goals that either apply across multiple subject areas (e.g., critical thinking) or include the acquisition of knowledge and understanding in a specific intellectual domain (e.g., numeracy, literacy, science, history). Therefore, academic achievement should be considered to be a multifaceted construct that comprises different domains of learning.

The present study concluded that Grow's Four Stage Self-Directed Learning model was very effective (magnitude of the effect of treatment is 1.67 which is maximum)in developing secondary school students' Academic Achievement. Initially the experimental group was better than the control in the pretest but in the post test after the implementation of Grow's Four Stage Self-Directed Learning model, this difference increased significantly.

There is a movement of the students of experimental group of standard IX, and they have progressed from Dependent (stage:1) to Interested(stage:2), Interested(stage:2) to Involved(stage:3) and Involved(stage:3) to Self-Directed(stage:4) and excelled in Academic Achievement by a programme based on Grow's Four Stage Self-Directed Learning Model.

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