REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 8 | ISSUE - 3 | DECEMBER - 2018

EFFECT OF TIME-ON-TASK ON ATTITUDE TOWARDS SCIENCE

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ABSTRACT

The investigator thought of students time-on-task as one variable, which could be altered by some instructional models or strategies. The Direct instruction model of teaching has operationalized engaged time or time-on-task and specifically indicates the type of learning activities to be provided at every phase of its syntax. Here the teacher plans proactively and is more concerned with teaching effectiveness and therefore is perceived to be more concerned with teacher accountability. The study is as an experimental work quasi-experimental design consisting of two Experimental groups and one Control group. 173 ninth grade students constituted the sample for the study. In order to measure academic achievement, ability, SES suitable tools have been used. Researcher developed observation schedule and lesson plans. Descriptive statistics and ANCOVA technique were used to analyze the data. The study resulted in several findings which have form implications on attitude towards science. The most prominent finding is Direct instruction is significantly more effective than the conventional method of teaching in terms of its effect on students' attitude towards science.

KEYWORDS: *Attitude, Science, Time-on-task, Teaching Methods, Experimental Group, Control Group,*

INTRODUCTION :

In India enrolment at the secondary stage for every 100 students 17.79% will complete the matriculation increasingly even at the matriculation stage students lack of basic competencies and skills necessaiy for their achievement. So, in this process of mass education there are many number reasons for the failures at the system. One of the reasons could be teacher accountability. It appears because of an increasing number of teachers subscribe to Scheffler's (1967) concept of teaching. The interaction between teacher and taught is like business like giving and taking, as Dewey's teaching is like selling and learning is like buying. In other words secondary school education seems to be becoming one-way communication. Therefore standard of education have to be joint venture between teachers and taught. So teacher behaviours includes many characteristics like clarify subject matter, competence, methods of teaching and models of teaching used in teaching, etc., which will directly related to pupils achievement and time-on-task behaviour of the students. So many investigations have shown time-on-task is positively related to achievement and retention. To the investigator knowledge few studies focussed on the effective domain variables, attitude towards science instruction, etc. Therefore researcher included these variables in the present study in addition to the attitude towards science.

REVIEW OF RELATED LITERATURE

Psachropoulous (1981) in his survey of research on the returns to education in 44 countries analysed the data using the cost benefit analysis approach. He found that: (i) the returns to primary education (whether social or private) are highest among all educational levels; (ii) private returns are in excess of social returns especially at university level; (iii) all rates of returns to investment in education are well above the 10 percent common yardstick of opportunity cost of capital; and (iv) the return to education in less developed countries is higher relative to the corresponding returns in more advanced countries.

Considering the high rates of return for education at the primary level, the Indian constitution has made provision for free and compulsory education up to 14 years for all children with the aim of achieving cent percent enrollment and retention. At the elementary level a number of programs like Operation Black Board, Minimum Levels of Learning, Special Training Program for Teachers (SOPT), DPEP, *Chmnara Angola,* Radio Broadcast Programme have been implemented with the objective of improving the quality of primary education including enhancing enrolment and retention.

But at the secondary level the same degree of zeal for providing quality education is not pronounced, even though the aims of secondary education are closely related to national development, leadership development, vocational efficiency and character formation. At present for every 100 students admitted to 1st standard about 27.74% are admitted to 8th standard and 17.79% complete matriculation (5th All India Educational Survey, 1992). Increasingly matriculates who score less than 50% at the Board Examination appear to lack basic competencies and skills necessary for their advancement. In this process of mass education, one of the reasons for the failures of the system, to achieve its objectives could be the lack of the accountability of teachers.

A large number of teachers, seem to subscribe to Scheffler's (1967) intentional view of teaching and not to his success view of teaching. It could mean that the teacher's focus is on his/her own teaching and not so much on the effects of his/her teaching; the effects of teaching being student growth in terms of achievement, adjustment and formation of attitudes. Teachers to that extent do not seem to hold themselves accountable for bringing about desirable changes in students. In such a situation teaching becomes one activity and learning another, related to each other more by accident than by design. Therefore teaching - learning needs to become a joint venture between teacher, students and policy makers.

Correlates of effective teaching can be classified under teacher variables, student variables and school variables. The factors connected to school variables are effective management of men, material and time. Hamischfeger (1977) found that the variation in total school hours across schools was from 710 to 1150 per annum. Clearly pupils in some school receive up to 50 per cent more school time than others. Wiley and Hamischfeger (1977) found that average number of hours of schooling per year was positively related to Reading and Mathematics Achievement. Carroll (1963), and Wiley and Hamischfeger (1974) opined that time is one of the essential components of educational improvement. While the researcher is aware of the role of time affecting teacher and school learning, a number of questions arises in this regard. (1) What are instructional characteristics that affect the student's opportunity to learn and thus the outcomes? Under what conditions can schools use time for effective learning? Given a fixed amount of time what type of teaching practices will increase the student engaged time in class? Further under what conditions can schools evolve the inherent tendencies to social reproduction in education? Such questions could be answered only when one thinks in terms of time factor. Learning is affected by quality of instruction and engaged time. Direct instruction has an inbuilt check to ensure quality of instruction in terms of its syntax.

Further, it has been found that equal opportunities in schools are bound to produce inequality, because all students irrespective of individual differences receive roughly equal time. Hence schools are inherently unequal. They not only produce gaps between the opportunities and outcomes, but also create greater gaps for socially disadvantaged students. Further schools have differential effect on students across ability levels. Hence, it is necessary to investigate the variables that moderate the relationship between the instructional time and achievement.

The objective of secondary school (among others) is the development of cognitive competencies, knowledge, abilities skills and beliefs in students. This objective can be attained to a larger extent by adapting suitable models like MLM and Direct instruction. Both these models have been widely researched on abroad. In India too MLM has been studied to some extent. (Singh 1983, Yadav 1984, Patadia 1987, Francina, 1995). However, Direct instruction has not been focussed on. Hence the investigator was interested in determining the effectiveness of Direct instruction in terms of student achievement, retention and attitude towards science. The purpose of the study is to investigate that effect of time-on-task on attitude towards science.

STATEMENT OF THE PROBLEM

The problem undertaken for the study is stated as : ***Effect of Time-on-Task on Attitude towards Science***

This is a quasi-experimental study. It is undertake with the purpose of finding effectiveness of time-on-task behaviours on attitude towards science of IX standard students. The time students spend in learning or engaged in learning is called as 'Time-on-task'. In this study time-on-task has been operationalised by using the direct instruction model.

Variables

The present study is designed with the following independent, dependent and control variables :

Independent Variables

1. Teaching Methods –

a) Time-on-task, Operationalized through the Direction Instruction
b) Conventional Method of Teaching

2. Ability

Dependent Variables

1. Students' Attitude towards Science

Control Variables

1. Intelligence
2. SES

Objective of the Study

i. To compare the attitude towards science of the following groups of students taught through Direct Instruction and Conventional method of teaching

a. The total groups
b. Students classified into three ability groups of Below Average, Average, and Above Average

Hypotheses

Keeping in view the above objective, the following hypotheses are stated :

1. There is no significant difference in the attitude towards science of pupils taught by Direct instruction and Conventional method of teaching.
2. There is no significant difference in the attitude towards science of pupils classified as Below Average, Average and Above Average in ability.
3. There is no significant interactive effect of teaching methods and students' ability on students' attitude towards science.

DESIGN OF THE STUDY

The pre-test, post-test non-equivalent control group design was followed. The major independent variable of study was time-on-task with two levels. Direct instructional strategy, and conventional method of teaching ; the dependent variable of study was attitude towards science ; control variables were intelligence and SES. Ability had three levels : Below Average (BA), Average (A), and Above Average (AA).

Sample

The subjects of the study were 173 ninth grade students of a private aided school selected purposively. In the study one section was designated as control group, whereas other two sections were designated as Experimental group–1 (E_1) and Experimental group–2 (E_2). Here two experimental groups were selected : E_1 and E_2. The sample was heterogeneous with respect to gender and age. Their age ranged from thirteen to sixteen. The number of students in E_1 was 60, and E_2 was 42 and control group was 71. These were intact groups.

Tools

The following tools were used for collection of data :

i. Science Attitude Scale by Avinash Grewal was used. The scale consists of 20 items. The opinions are recorded on Likerts' five point scale. The reported reliability of the test was 0.75 (test-re-test) and 0.87 (split-half).

ii. Raven's Standard Progressive Matrices was used to measure intelligence of the students. There were totally 60 items (in 5 sets of 12 items each) arranged according to order of difficulty. The test had test-retest reliability varying from 0.83 to 0.93.

iii. Kuppuswamy's SES Scale was used to measure Socio-Economic Status of the students. The scale has eight categories under education indices and six categories under occupation with respective weightages. The test validity is measured by matching against outside criteria.

iv. Investigator developed Observation Schedule for observing students' on and off task behaviour. The observation system was a sign system with an inter-rater reliability of above 0.80 and above.

v. Lesson plans were prepared using direct instruction syntax.

Collection of Data

Phase - I

The subjects of the study were administered Raven's Standard Progressive Matrices Test, Kuppuswamy's SES Scale and Grewal's Science Attitude Scale by the investigator personally by visiting the selected school.

Phase - II: Training

Teachers were trained in Direct instruction model as it was used for maximising student learning time and increasing student on-task behaviour. They were given orientation regarding the model by the investigator. Next the investigator trained observers regarding observation of on and off-task behaviour of students in the classroom.

Phase - III

In the third phase of the treatment, teaching of physical science of IX standard was implemented. Four units from IX standard physical science textbook, prescribed by the Directorate of State Education Research and Training of Government of Karnataka formed the content.

The investigator trained two teachers in Direct instruction (to enhance on-task behaviour of students). They taught two intact classes, IX - C and IX – D. which were considered as Experimental group 1 (E_1) and Experimental group 2 (E_2) respectively, using the syntax of the Direct instructional model.

In the present study, two teachers were used for the experimental treatment of the two experimental groups. The units selected were : (i) Motion, (ii) Energy Work and Power, (iii) Waves and (iv) Human Eye.

Trained B.Ed. graduates taught the two experimental groups for twenty periods of fifty five minutes duration ; while the regular classroom teacher taught the control group for a total of sixteen classes of forty five minutes each.

Students' time-on-task was observed at the time of the experimental treatment. Three trained observers for each class were assigned to observe the students on-task behaviour.

Statistical Techniques

In order to test the hypotheses stated in this study, the statistical techniques employed were : descriptive statistics like Mean and SD and inferential statistics, such as, Analysis of Co-variance and Scheffe's tests. The Analysis of Covariance (ANCOVA) permits the experimenter to eliminate initial differences on several variables between the experimental and control groups by statistical methods.

Analysis and Interpretation

The following table furnishes the data and results of the impact of time-on-task on attitude towards science.

Analysis of the Attitude towards Science in Groups E_1, E_2 and C

The summary of the ANCOVA of the dependent variable gain in attitude towards science under two levels of teaching methods and three levels of ability are reported in below table

Table – 1 : Summary of Gain in Attitude towards Science based on Selected Variables

Levels	Experimental Group – 1				Experimental Group – 2				Control Group			
	N	Y_1	X_1	X_2	N	Y_1	X_1	X_2	N	Y_1	X_1	X_2
BA	32	823.2416	960.3648	436.0224	10	269.180	370	137	25	436.8975	808.5225	350.7575
A	17	408.0187	702.4638	246.7431	8	175.04	364	124	21	367.4748	958.9125	305.9448
AA	11	214.5022	502.337	160.4163	24	567.9072	1084.2864	371.8296	25	413.7825	1168.75	378.75
Total	60	1445.7625	2165.1656	843.1818	42	1012.1272	1818.2864	632.8296	71	1218.1548	2936.185	1035.4523

Table – 2 : Analysis of Co-variance of Dependent Variable Attitude towards Science (Y) by Independent Variables Teaching Methods and Ability of Three Groups E_1, E_2 and C

Source of Variation	SS	df	MS	F – Value	Significance
Teaching Methods	737.927	2	368.963	2.825	P > 0.05
Ability	138.634	2	69.317	0.531	P > 0.05
Teaching Methods X Ability	255.535	4	63.884	0.489	P > 0.05
Error	21155.604	162	130.590		
Total		170			

Out of three F - values calculated, F-Values of two main effects were found to be not significant at the 0.05 level.

The F value for the main effect of teaching method (2.825) with df 2/162 is found to be not significant at 0.05 level of confidence. Hence, null hypothesis is rejected. It implies that there is no significant difference in the attitude towards science of the Experimental groups (E_1 and E_2) and Control group.

The F value for the main effect of ability is (0.531) with df 2/162 is found to be not significant at 0.05 level of confidence. Hence null hypothesis is accepted and alternative hypothesis is rejected. It means that there is no significant difference in the attitude towards science of different categories of students Below Average, Average and Above Average.

The F value for the interactive effect of teaching methods and ability is (0.489) with df 4/162 is found to be not significant at 0.05 level of confidence. Hence null hypothesis is accepted and alternative hypothesis is rejected. This implies that, there is no interactive effect of teaching method and student ability on attitude towards science of students. That is to say that attitude towards science of the different groups having different ability levels are not differentially affected by treatment given to them. Further analysis is not carried out as F is not significant.

Adjustment of Means

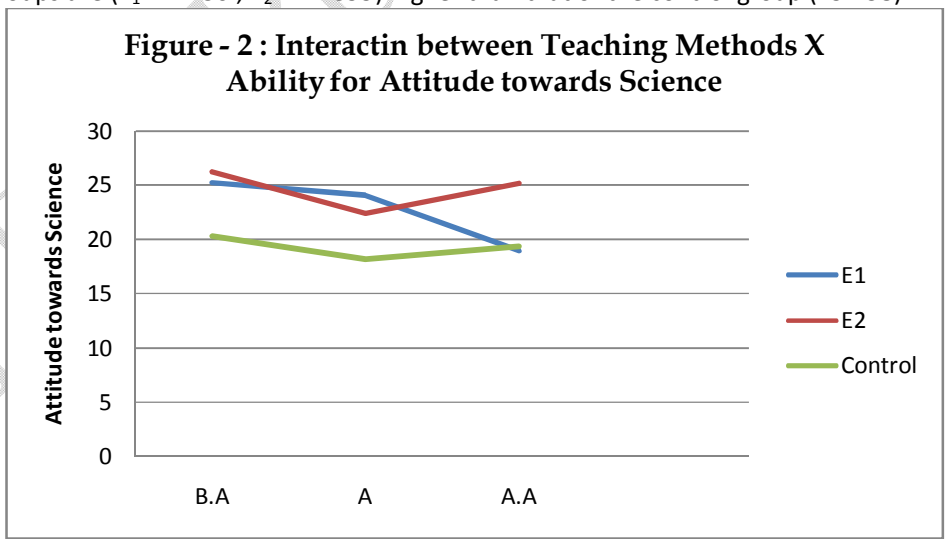
In order to nullify the effect of control variables Intelligence and SES, adjusted means were calculated. In this regard the procedure given in Winer (1962) (p.600) was followed.

The adjusted means were reported in the following table

Table – 3 : Adjusted Means of Gain Scores in Attitude towards Science based on Selected Variables

Ability	E_1	E_2	Control
BA	25.233	26.230	20.304
A	24.053	22.400	18.207
AA	18.965	25.186	19.383
Total	22.750	24.599	19.298

Table above table indicates that the adjusted means scores in attitude towards science of the treatment groups are (E_1 = 2.750 ; E_2 = 24.599) higher than that of the control group (19.298).



Adjusted means of the Above Average students of group E_2 (25.186) is higher than the group E_1 (18.965) and control group (19.383).

Adjusted means of the Average students of the group E_1 (24.053) is higher than the group E_2 (22.400) and control group (18.207).

Adjusted means of the Below Average students of group E2 (26.230) is higher than the group E_1 (25.233) and control group (20.304).

Adjusted means of attitude towards science of the Below Average students of group E_1 (25.233) is equal to the Above Average students of group E_2 (25.186).

Adjusted means of Above Average students of control group is (19.383) equal to the Average students of the group E_1 (18.965).

FINDINGS

The study revealed the following findings :

1. Attitude towards science of the different groups having different ability levels are not differentially affected by treatment given to them.
2. Attitude towards science of Above Average students of group E_2 is higher than the group E_1 and control group.
3. Attitude towards science of Average students of the group E_1 is higher than the group E_2 and control group.
4. Attitude towards science of Below Average students of group E2 is higher than the group E_1 and control group.
5. Attitude towards science of Below Average students of group E_1 is equal to the Above Average students of group E_2.
6. Attitude towards science of Above Average students of control group is equal to the Average students of the group E_1.

CONCLUSIONS

Based on the above findings, the following conclusions are drawn :

1. Time-on-Task is more effective technique in building positive attitude among Above Average students in the experimental group E_2.
2. Average students in the experimental group in E_1 are benefited more by the technique Time-on-Task.
3. Below Average students of group E_2 have favoured more attitude toward science because of the influence of Time-on-Task.
4. Even students who are Below Average in group E_1 have also developed favourable attitude towards science when compared to Above Average students in group E_2.
5. Above Average students in control group and Average students in group E_1 have been equally benefitted by the technique Time-on-Task.

EDUCATIONAL IMPLICATIONS

The implications of this research will also extend beyond classrooms, teachers and administrators. In a general sense, this type of research has implications for policy decisions related to the scope of syllabus prescribed by the Department of Public Instruction, allocated time for each subject and annual instructional planning of the teacher and choice of instructional strategies. Mere quantitative increase in allocated time may not bring in the desired improvement in learning.

Another dimension is that the role of the principal in enhancing instructional time. If teachers are to make the adjustments necessary to enhance the on-task behaviours of pupils, certain changes and accommodations will be required within the classrooms. That will not only require academic suggestions but also the substantial support of principals.

In most of the schools the principal is the person who is in the best position to provide the type of educational leadership required. The actual implementation of these research findings requires alterations

to behaviour and skills. School-wise adoption could necessitate substantial change within the existing school practices. Under these circumstances the role of the principal as an innovator becomes a necessary condition in schools.

A fourth implication is for pre and in-service training of teachers. The syllabus of the B.Ed. programme should include theoretical information about the correlates of teacher effectiveness rather than just giving information about methods of teaching. In the papers on content-cum-methodology (special methods of teaching), the variables identified by Rosenshine and Furst, Fisher, *et al*., may be elaborated. The models of teaching dealing with individualized teaching may also be introduced in the syllabus under the Practice teaching components. In addition to the lessons involving the Herbartian methods, three or four lessons involving Direct instruction/mastery learning may be practiced by the trainees; such experiences will help the trainees to become aware of the wide choice available on teaching methods. It will also help to bring altitudinal changes towards teaching styles and strategies. As for inservice teachers, periodically their competencies need to be enhanced by holding workshops on the more recent advances in the area of teaching effectiveness. One of the programmes could be on instructional time as implemented in models of teaching. It helps to solve many problems of students by ensuring students to be on-task in the class hours.

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