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

IMPACT OF TIME-ON-TASK ON ACHIEVEMENT IN SCIENCE

Dr. (Smt.) Prabhavati S. Guddadanveri
Principal, University College of Education,
Karnatak University, Dharwad.

ABSTRACT

Time-on-task refers to portions of time during which students are paying attention to a learning task and attempting to learn. Carroll's work is widely regarded as the beginning of modem inquiry into the effects of time factors in the learning process. His major premise was that school learning is a function of time. The purpose of the study is to investigate that impact of time-on-task on achievement in science. The study is as an experimental with quasi-experimental design with 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 were used to analyze the data. The study revealed many interesting findings. The most prominent finding is achievement gain scores of experimental groups (E_1 & E_2) are higher than the achievement gain scores of control group. The performance of the group taught by direct instruction is better than the students in conventional method of teaching.

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

INTRODUCTION :

Time-on-task tells something about teaching that is it reveals the teachers' skill in setting learning activities which engage students' attention and keeping them focussed. Time-on-task refers to portions of time during which students are paying attention to a learning task and attempting to learn. This excludes time spent on socializing, day dreaming, engaging in antisocial behaviour, etc. (Fisher, et. al., 1980). Time-on-task is an alterable variable (Bloom, 1980) and has a significant and possibly causal relationship with school learning, so it can be altered positively or negatively by instructional process and this has direct consequence for learning that will take place.

Carroll defined time spent as a function of (i.e., resulting from or composed of) opportunity and perseverance. The measure he proposed for opportunity was allocated time or the amount of time the classroom teacher made available for school learning. The measure Carroll proposed for perseverance was engagement rate or the percentage of the allocated time that students were actually on-task.

In the later models involving instructional time aptitude has been defined as learning rate with time being varied and not as learning level with time being held constant (Bloom). Hence, Time-on-task was conceptualized as an alterable variable and one which has significant and possibly causal relationship with school learning and students' achievement. The instructional process can alter it positively or negatively and this (alteration) has direct consequences for the learning that will take place.

That time-on-task is causally related to achievement and time-on-task is alterable, holds the promise for improvement in school learning irrespective of whether time-on-task is viewed as an end in itself (e.g., Jackson) or as a means to an end (e.g., Carroll and Bloom).

The prospect of altering and in fact, optimizing such time is of great instructional importance for the understanding of classroom procedures. The purpose of study is to investigate that impact of time-on-task on achievement in science.

REVIEW

A few studies (e.g., Wiley and Hamischfeger 1974; Kidder, O'Reilly, and Keisling (1975) have found a strong positive relationship between quantity of schooling and achievement and some investigators have found virtually no relationship (e.g., Smith, 1979 and some of the studies reviewed by Borg 1980). But most researchers and reviewers have identified a weak, non-statistically significant - but positive - relationship to achievement. This general finding has emerged from the work of Anderson (1980, 1981); Blai (1986); Borg (1980); Brown and Saks (1986); Cotton and Savard (1981); Fisher and Berliner (1985); Fredrick and Walberg (1980); Honzay (1986-87); Karweit (1976, 1985); Leach and Tunnecliffe (1984); Levin and Tsang (1987); Lomax and Cooley (1979); Mazzarella (1984); O'Donnell (1978); Quartarola (1984); and Walberg (1988).

Obviously, if no time is allocated for learning a particular subject, then learning will not take place. But what the above mentioned researches indicate is that when students experience greater quantities of allocated time, their achievement is only very slightly higher than those experiencing less quantities. The purpose of study is to investigate that impact of time-on-task on achievement in science.

Statement of the Problem

The problem undertaken for the study is stated as : ***Impact of Time-on-Task on Achievement in Science***

This is a quasi-experimental study. It is undertake with the purpose of finding effectiveness of on-task behaviours on achievement in 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 Variable

1. Students' Achievement in Physics

Control Variables

1. Intelligence
2. SES

OBJECTIVE OF THE STUDY

i. To compare the achievement in Physics 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 achievement of pupils taught by Direct instruction and Conventional method of teaching.
2. There is no significant difference in the achievement of pupils when they have been classified as below average, average, and above average in ability.
3. There is no significant interactive effect of teaching methods and students' ability on student achievement.

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 achievement ; control variables were : intelligence and SES. Ability had three levels : below average, average, and above average.

Sample

The subjects of the study were 173 ninth grade students of a private aided school selected purposively. There were four sections IX-A, IX-B, IX-C, IX-D. In the study IX-B class was designated as control group where as IX-C and IX-D 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. Investigator developed summative and formative tests. These tests have descriptive validity. Reliability was established by following Subkaviak's procedure (1988). The calculated Po ranged from 0.73 to 0.93. Summative test was developed by randomly selected items from 14 formative tests. The summative test includes 100 items. It was used for pre–test as well as for achievement test. The test has satisfactory reliability (Subkaviak (1988) Po= 0.80, 0.97).

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 Summative Achievement Test, Raven's Standard Progressive Matrices Test, and Kuppuswamy's SES Scale.

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.

Phase - IV: Post-testing

After completion of teaching the 14 sub-units, the investigator administered the same summative test used for pre-testing of students. No time limit was specified but on an average the subjects took 60 minutes.

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

Analysis of the Achievement in Groups – E_1, E_2 and C

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

Table – 1 : Summary of Gain in Achievement (Y) Teaching Methods and Ability, Intelligence (X_1) and SES (X_2) of Three Groups

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	2154.832	960.3648	436.0224	10	762.21	370	137	25	1329.8825	808.5225	350.7575
A	17	1093.1425	702.4638	246.7431	8	630.7	364	124	21	1095.0282	958.9125	305.9448
AA	11	816.6015	502.337	160.4163	24	2027.2104	1084.2864	371.8296	25	16.4.625	1168.75	378.75
Total	60	4064.576	2165.1656	843.1818	42	3420.1204	1818.2864	632.8296	71	4029.5357	2936.1585	1035.4523

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

Sources of Variation	SS	df	MS	F – Value	Significance
Teaching Methods	14385.657	2	7192.829	138.039	P < 0.01
Ability	2258.671	2	1129.395	21.673	P < 0.01
Teaching Methods X Ability	280.309	4	70.077	1.345	P > 0.05
Error	8441.390	162	52.107		
Total		170			

Out of three F - values calculated, F-Values of two main effects were found to be significant at the 0.01 level.

The F-value for the main effect of teaching method (138.039) with df (2/162) is found to be significant at 0.01 level of confidence. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It implies that there is a significant difference in the achievement of Experimental groups (E_1 and E_2) and Control group.

The F value for the main effect of the ability (21.673) with df 2/162 is found to be significant at 0.01 level. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that there is a significant difference in the achievement of different categories of students : Below Average, Average and Above Average. So further analysis was carried out using Scheffe's test.

The F value (1.345) with df 4/162 for the interactive effect of teaching methods and ability is not found to be significant at 0.05 level of confidence. Hence, null hypothesis is accepted and alternative hypothesis is rejected. This implies that there is no interaction effect of teaching methods and ability level of students on student achievement. Thus it implies that achievements of different groups having different ability levels are not differentially affected by treatment given to them. Further analysis was not carried out, as F value was 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.

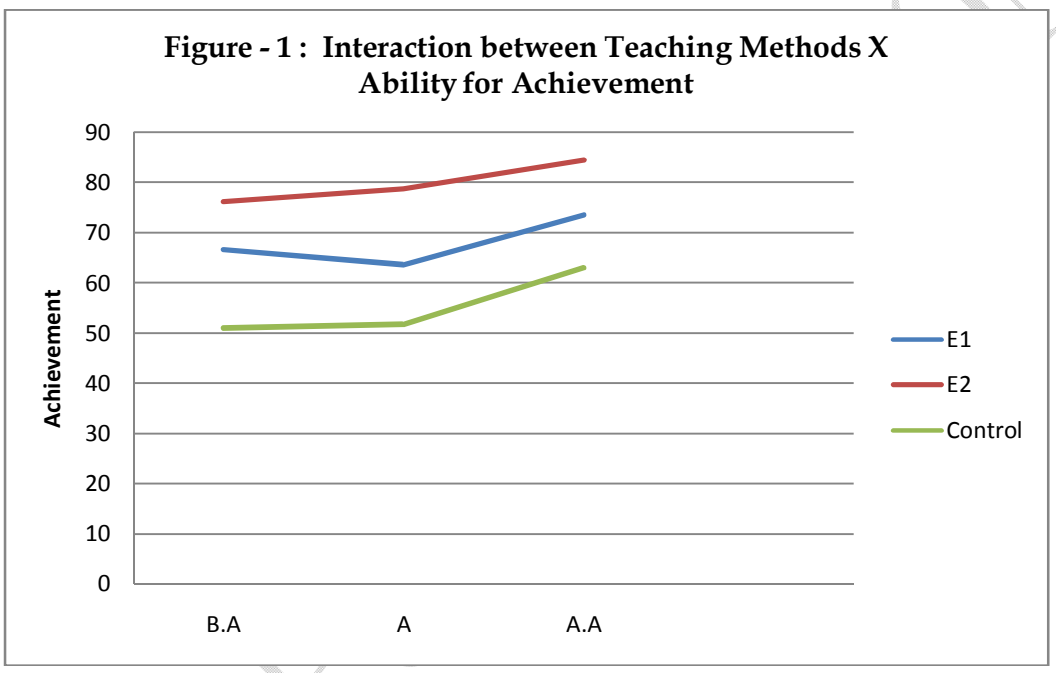
The obtained adjusted means are reported in the following table.

Table–3 : Adjusted Means of Gain in Achievement (Y) under Teaching Methods and Ability against Intelligence (X_1) and SES (X_2) of Three Groups E_1, E_2 and C

Ability	E_1	E_2	Control
BA	66.642	76.188	51.083
A	63.601	78.767	51.846
AA	73.606	84.486	63.070
Total	67.950	79.813	55.333

It is revealed from the above table that, the adjusted means of the gain in achievement of the treatment groups (E_1 = 67.950 ; E_2 = 79.813) are higher than that of the control group (55.333).

Figure - 1 : Interaction between Teaching Methods X Ability for Achievement



Adjusted means of the Below Average, Average and Above Average students of the groups E_1 and E_2 are higher than the respective Ability groups of the control group.

Adjusted means of above average students of control group is (63.070) equal to the adjusted means of gain achievement of the Average students of the group E_1.

Adjusted means of the Below Average students of the group E_1 (66.642) is higher than the adjusted means of gain in achievement of Average students of group E_1 (63.601).

FINDINGS

The following findings were drawn :

i. Achievements of different groups having different ability levels are not differentially affected by treatment given to them.

ii. Below Average, Average and Above Average students of the groups E_1 and E_2 are higher than the Ability groups of the control group.

iii. Above average students of control group is equal to the adjusted means of gain achievement of the Average students of the group E_1.

iv. Below Average students of the group E_1 is higher than the adjusted means of gain in achievement of Average students of group E_1.

CONCLUSIONS

The following conclusions were drawn :

1. Achievement gain scores of experimental groups (E_1 & E_2) are higher than the achievement gain scores of control group.
2. Adjusted means of the Below Average, Average and Above Average students of the groups E_1 and E_2 are higher than the respective ability groups of the control group. However, Below Average students of the group E_1 are benefited by Direct instruction than the Average group of students.
3. The trend of the relationship shows that below average students of the experimental group E_1 are benefited by the Direct instruction.
4. The performance of the group taught by Direct instruction is better than the students taught by conventional method of teaching.
5. The achievement of the different ability levels of students E_1 and E_2 are better than the respective ability levels of the students of control group.
6. The trend of the relationship shows that below average students of group E_1 are benefited by the treatment given to them when compared to average students of group E_1.

EDUCATIONAL IMPLICATIONS

The present study has revealed that below average students achievement is higher than the average students under the Direct instruction. Hence Direct instruction strategy is more beneficial to low ability students leading one to hypothesise the existence of Aptitude Treatment Interaction (ATI). If further researches testing the ATI hypothesis confirm the effect, then the finding has a significant educational implication for individualized instruction by matching teaching strategies with student variables.

Another implication of the study is that the Direct instruction maximizes student learning by providing adequate "practice" in learning. The syntax of the Direct instruction model involves the three phases of practice and as observed in the study Direct instruction strategy requires more allocated time. In the context of Indian educational system of large classrooms, substantial syllabus and provision of uniform time to all students, interested schools and teachers have to carve out additional time by using school and teacher specific strategies for the benefit of the average and below average students. This action seems to be imperative, as the findings of the study have indicated that below average students are benefited by Direct instruction.

REFERENCES

Anderson, L. (1981). Instruction and Time-on-Task : A Review. *Journal of Curriculum Studies,* 13: 289-303.

Borg, W.R. (1980). *Time and School Learning.* In Time to Learn, edited by C. Denham and A. Lieberman. Washington, D.C. : National Institute of Education.

Carroll, J.B. (1963). A Model of School Learning. *Teachers College Records,* 723-33.

Fisher, C.W. and Berliner, D.C. (eds.) (1985). *Perspectives on Instructional Time.* New York : Longman.

Garrett, H.E. (1967). *Statistics in Psychology and Education.* Bombay : Vakils, Peffer and Simons Private Limited.

Karweit, N. and Slavin, R.E. (1982). Time-on-Task : Issues of Timing, Sampling and Definition. *Journal of Educational Psychology,* 74(6), 844-851.

Kuppuswamy, B. (1972). *Socio-Economic Status Scale.* Delhi, Manasayan.

Leach, D.J. and Tunnecliffe, M.R. (1984). The Relative Influence of Time Variables on Primary Mathematics Achievement. *The Australian Journal of Education,* 28 : 126-131.

Odonnell, H. (1978). Instructional Time as Related to Reading Achievement. *The Reading Teacher,* 32: 246 - 251.

Quartarola, B.A. (1984) *A Research Paper on Time on Task and the Extended School Day/Year and Their Relationship to Improving Student Achievement.* Sacramento, CA : Research, Evaluation and Accreditation Committee, Association of California School Administrators, (ED 016 89).

Smith, N.M. (1970). Allocation of Time and Achievement in Elementary Social Studies. *The Journal of Educational Research,* 231-235.

Winer, B.J. (1962). *Statistical Principles in Experimental Design.* London: McGraw Hill, Inc., Book Company.

Dr. (Smt.) Prabhavati S. Guddadanveri
Principal, University College of Education, Karnatak University, Dharwad.