Effect of Self-instructional Modules on Social Science (Geography) Achievement of Secondary School Students in Relation to their Intelligence and Gender

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Abstract

In this study, the researcher studies the effect of Self-instructional Modules on social science (Geography) achievement of Class IX students in relation to their intelligence and gender. The sample is selected from three secondary schools of Agra district, UP, India. The sample comprises 320 students. Pretest and post-test equivalent group design of true experimental research is used to find the answers to the problem. For testing achievement, self-made achievement test is used by the researcher. J C Raven's Standard Progressive Matrices test is used for the assessment of intelligence in this study. For data analysis, t-test and Pearson correlation and ANCOVA techniques are used through SPSS. The researcher finds out that there is no significant difference in academic achievement in terms of gender. Boys and girls have performed equally in terms of achievement. Secondly, there is no significant difference in intelligence in terms of gender. Boys and girls have equal intelligence. Also, there is no significant relationship between academic achievement and intelligence. Self-instructional Modules are found to be more effective than the traditional teaching method.

Keywords: *Self-instructional Module, Achievement, Intelligence, Secondary Students, Geography, Gender*

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Introduction

Last year, a report was published on new global education monitoring (GEM) announced by United Nations Educational, Scientific and Cultural Organization (UNESCO). The report says that India is expected to achieve universal lower secondary education by 2060 and universal higher secondary education by 2085. It is a long time to reach the goal. The dissatisfactory condition of secondary school education is due to a number of reasons.

If we see the *Educational Statistics at a Glance 2018* (Table no. 16 and 32) uploaded on the website of (MHRD), dropout rates at secondary levels for all categories of students in India are 50%. Dropout rates in case of secondary level has gone down from 82.5% in 1980–81 to 50.3% in 2011–12. In 2011–12, the dropout rates at secondary levels for all categories of students were 50.3%. Although it is lower if compared to the number in 1980, still many students drop their school education due to lack of money, inadequate/ non-performance in class, not getting attention by the subject teacher, non-involvement of parents, not knowing how to improve their study habits for high achievement, how to improve their intelligence for high achievement, non-clarification of concepts and use of traditional teaching method as well as only one textbook for one subject. We can find writings on the problems of secondary education in India in various reports, surveys and researches done by educationists and researchers. Some problems occur due to family instability, single parents; obligation of taking up a job, teacher's routine work, poor study habits and stereotype teaching. In India, we have a large population of secondary school students in terms of interest, personality, learning style, attention, reasoning style habits, socio-economic status type of school, location, etc. They are not able to learn with the same teaching method. It is high time to be provided some alternative teaching method to the secondary students so as to help them obtain their desired achievement. The researcher believes that one of the main reasons for dropouts of secondary school students is the use of only one type of teaching method. Self-instructional Modules can play big role to clear concepts to students; it is a self-learning material and learner-centred approach. If we consider secondary school students, different researches show that, there is a positive relationship between intelligence and academic achievement. This study finds that, there is no relationship between academic achievement and intelligence (Dhull, 2012). This study also locates no effect of intelligence on the experimental group (Self-instructional Modules). We can find a person's intelligence on the basis of one's behaviour in the context of one's environment. Intelligence plays a big role in achievement. If students have no proper environment to use their intellectual abilities,

then intellectual development is not possible. Also, they would not be able to use their intelligence to the optimum. If students are intelligent then they can do better in achievement. Although nothing can be done about the heredity, we can only provide them a healthy atmosphere to improve their mental abilities so that they can behave, react, and solve any problem intelligently. 'We need to develop suitable methods of teaching and instruction among the secondary level students a contributing factor for developing intelligence which is essential for high academic achievement' (Danistha, 2014).

Self-instructional Modules

Self-instructional Modules comprise self-instructional material, which is based on individualised instruction. At the time of developing this module, some principles were followed, such as active responding, self-pace controlled by learner, semi-formal way of writing, continuous evaluation, and self-evaluation.

"Self-instructional Module is a package of well organised learning practices in an interactive way that helps to understand well defined content independently, based on specific objectives" (Satyarthi, 2015).

Programmed learning material and computer-assisted instruction have also been part of such principles. This printed module can also be used as a software through computer. In this study, Self-instructional Modules are developed in social science (Geography) on the topic of lithosphere (environment's concept, importance and elements, types of rocks, layers of earth, and endogenetic and exogenetic forces on lithosphere), which is included in the half-yearly examination syllabus for social science (Geography) of Class IX under the UP Board. The development of Self-instructional Modules is done in the following manner.

Selection of the Content

It was decided on the basis of the suggestions of experienced subject teachers in the first session of the year. It was presented before the students easily with the help of coloured pictures. The module was written on the topic of lithosphere, which is included in the syllabus of half-yearly examination for social science (Geography) of Class IX.

Content Analysis

Selected topics were divided in the sub-topics on the basis of content analysis and were arranged in a sequence. All the topics were divided and written in three parts on the basis of content analysis — Part 1: environment's concept, importance and elements, types of rocks, layers of earth; Part 2: endogenetic forces on lithosphere and Part 3: exogenetic forces on lithosphere.

Writing Module

They were written in the module. Every part of the module starts with the terminal behaviour related to a particular topic. Then,

the presentation is written and arranged according to the content related learning activities in semi-formal ways, such as live classroom interaction with the help of coloured pictures, followed by problematic questions, and lastly, summary. Once the summary was provided and problematic questions were answered, at the end, each part was completed with practice questions in the form of fill in the blanks, true-false and one-word substitution.

Expert Advice

After writing the module, experienced subject teachers were consulted for corrections and reforms in the module. The researcher went to the secondary schools and asked geography teachers to correct the module. Based on the suggesions of the experts, various pictures, questions and statements were changed and added in the module by the researcher.

Tryout

The researcher gave the module to a Class student to read; to check the language, style, difficult words and to know if there is any difficulty in reading.

Researches also tried out self-instructional modules and achievement tests on a small group of students to know the reliability; value, difficulties and effects of self-instructional modules.

Academic Achievement

It means the amount of knowledge gained by the students in different subjects of study.

In this study, academic achievement is determined by the marks obtained by the students in post-test scores. The post-test scores are taken as achievement of students. A self-made criterion reference test is used by the researcher as achievement test. Before taking the pretest, the researcher assigned the classes into the control group (Traditional teaching method) as C section and experimental group (Self-instructional Modules) as E-section. For data collection and to know the achievement, a self-made achievement test was administered as pretest on both the groups. After that, treatment was given to the groups and at the end of experiment, the post-test was administered on both the groups to know the achievement in social science (geography). This achievement test was used to take scores on the basis of pretest and post-test. Selected response format was used by the researcher for writing the items. The questions were objective in nature, due to which scoring was fast and easy. Multiple choice items with four alternatives were made in this rough draft. Then the test was tried out on a small group of students. After this, the researcher personally approached the experienced subject teachers to get suggestions with respect to language, spelling, irrelevant and

repeated items, and covering of related topics as well as estimation of administration time of the test. After getting valuable suggestions from experts, the researcher decided to make changes in items. After the tryout of achievement test, all the scores were drawn and arranged in an ascending order. For quantitative item analysis, all the scores were divided into three parts after taking 27% from the upper and lower group apart from this average groups'. 'Twenty-seven per cent provides the best compromise between two desirable but inconsistent aims: (i) to make the extreme groups as large as possible and (ii) to make the extreme groups as different from the other as possible.' (Eble and Frisbe, 199:227). Discrimination value of each item was calculated by the help of this formula (H – L)/N/2, where H= the number of correct scores from high scoring group on the item; L= the number of correct scores from low scoring group on the item; N= the total number of students in the two groups. Then, the difficulty value was calculated with the help of this formula A/N×100, where A= a number of subjects, answered the item correctly; N= the total numbers of subjects responding to the item. All the items of the final achievement test had the range of difficulty value from 0.20 to 0.68 as well as discrimination value from 0.17 to 0.68. Both calculated values of every item were checked by the critical values. In final, achievement test consisted 36 items after the pilot study. It was a criterion referenced test related to the specific objectives. Therefore, some items were discarded to maintain the reliability value of the achievement test, which was calculated with the help of SPSS. Since the reliability value of this achievement test was by the Cronbach's Alpha method is 0.79. This test also had content and construct validity. 'Content evidence is based on careful examination of course textbooks, syllabi, objectives and the judgements of subject matter specialist' (Best and Kahn, 2012:295). So for surety of this, different topics and sub topics were tested carefully as well as all the items were included according to the specific objectives. Content validity was determined on the basis of the judgement, by the same subject experts in geography of Class IX. Construct validity was established by the correlation of coefficient of Cronbach Alfa method. All the items of final achievement test had the correlation of coefficient with the value of 0.78 to 0.80.

Intelligence

"Intelligence is the aggregate or global capacity of an individual to act purposefully, to think rationally and to deal effectively with his environment" (Wechsler, 1944).

For assessing intelligence, the Standard Progressive Matrices test developed by J.C. Ravens (1983) was used in this study. It is for the age of 6 to 65 years. The test has 60 items which are classified into five

parts. It has no time limit and can be administered in both group and individuals. Co-efficient of reliability of this test is 0.83 and 0.93 with different age group by test-retest method. This is a culture-free test since, social and cultural factors cannot affect the result.

Delimitations

- This study was limited to the secondary students of Class IX only.
- The syllabus was related to the UP Board.
- Self-instructional Module was developed in social science (geography).
- All the schools were Hindi medium.
- Only specific topics (Environment's concept, importance andelements, types of rocks, layers of earth, endogenetics and exogenetic forces on lithosphere) were taken to develop the Self-instructional modules.

Achievement may be influenced by many other different variables. In this study, only intelligence, SES and gender were included.

Researches related with Achievement and Intelligence

The research studies related to the present finding claims that there is positive relationship between academic achievement and intelligence of secondary school students like the works of Morosanova (2015), Danishta (2014), Chandra and Ajimuddin (2013), Heaven and Chairochi (2012), Laidra (2006), Garg and Chaturvedi (1992), Rani (1992), Shah (1990) and Singh (1981). Dhull (2012) and Naderi et al., (2008) found no relationship between academic achievement and intelligence of secondary school students. Clemens (2017) found that Class IX school grades correlate only moderately with intelligence. Nyicor (2016) found that students are bright but average in academic achievement.

Researches Related with Effect of Self-instructional Modules on Achievement

This study found that Self-instructional Modules are more effective in comparison to the traditional teaching method on achievement of secondary school students. Similarly, some researchers also compared Self-instructional Modules and traditional teaching method, namely Justus (1981), Madjiman (1982), Hooper (1982), Mohammd (1988), Al-Quattan (1989), Madhuman (1990), Kumar (1990), Santosh (1990), Arunachalam (1991), Watson (1991), Trehan (1994), Hajeena (1995), Nayer and Shubha (1999), Kohal (1999), Binuman (2000), Mathew (2000), Sharma (2000), Kumar and Anita (2004), Pazhenival (2004), Vig (2005), Ahuja and Singla (2005), John (2006), Khan, et al., (2010), Ali, et al., (2010), Dubey (2011), Das (2012), Marwin and Madhia (2012), Sufiyana (2012), Aliyas and Siraj (2012), Syafin

and Yasin (2013), Kiong, et al., (2013), Avnish (2014), Padmpria (2015), Satyarthi (2017), Kour, et al., (2017), Augus (2017), Kumar and Anita (2004).

Researches Related with Achievement and Gender

Hassan (2012), Vakharia (2017), Susai (2009), Satyarthi (2018) and Herbert and Stipek (2005) found that there is no significant difference in academic achievement in terms of gender. Sutherman (2011) found boys to be better in achievement. Satyarthi (2017) found that gender has no effect on Geography achievement of Class IX students in control and experimental group. Raju (2016) found differences in academic achievement in terms of gender.

Objectives

1. To compare the academic achievement (AA) of male and female students of Class IX.
2. To compare the intelligence of male and female students of Class IX.
3. To study the relationship between academic achievement (AA) and intelligence of Class IX students.
4. To compare the effect of intelligence on post-test scores in social science (Geography) of control (traditional teaching method) and experimental (Self-instructional Modules) group.
5. To compare the effect of the experimental group (Self-instructional Modules) and control group (traditional teaching method) on post-test scores in social science (Geography) by controlling the effect of pretest and intelligence scores as covariates.

Hypotheses

1. There is no significant difference in academic achievement (AA) of male and female students of Class IX.
2. There is no significant difference in intelligence of male and female students of Class IX.
3. There is no significant relationship between academic achievement (AA) and intelligence of Class IX students.
4. There is no significant effect of intelligence on post-test scores in social science (Geography) of experimental (Self-instructional Modules) and control group (Traditional teaching method).
5. There is no significant effect of the experimental group (Self-instructional Modules) and control group (Traditional teaching method) on post-test scores in social science (Geography) by controlling the effect of pretest and intelligence as covariates.

Methodology

Pretest and post-test equivalent group design was used in this study given by Campbell and Stanley. (Campbell and Stanley, 1963:13).

R E	O1	XO2
R C	O3	O4

A sample of 320 students of Class IX was taken from three secondary schools of the Agra district of Uttar Pradesh, India. This sample size seemed enough to collect the data since a big sample would take more time to experiment, would increase the time duration, and it would also affect the maturity of the students. These Hindi medium schools are affiliated with the Uttar Pradesh Board of Secondary Education. Among 320 students, there were 200 boys and 120 girls. Convenience cum randomisation technique was used for sampling. Students were divided into control and experimental groups on the basis of randomisation (even-odd numbers of their roll numbers).

There were two types of tools used in this study. One was measuring tools as — Achievement Test, Intelligence Test and Socio-economic Status Scale. Second was treatment tools as traditional teaching method and Self-instructional Modules.

In this study, for testing achievement, the post-test marks were taken into consideration. The data collection procedure was followed in three stages— pretest stage, treatment stage and post-test stage. Stage I—Pretest: at this stage, self-made achievement test as pretest, intelligence Test by J.C. Ravens and the Socio-economic Status Scale by Upadhyaya and Saxena were administered on the whole sample one by one. At the time of administering, all the norms and instructions were followed by the researcher, as given in the manuals. The pretest stage continued for two days. Stage II— Treatment: Treatments were given for a duration of sixteen days to both groups. Both groups were given equal time periods for the treatment, taught the same topics. Both groups had the same objectives and equal chance to learn, revise and test to achieve the learning objectives. The control group was taught through the traditional teaching method (chalk and talk) by the researcher with the help of explanation and interaction based on Class IX social science (Geography) textbook material of the syllabus of Uttar Pradesh Madhyamik Shiksha Parishad. This group was also taught all the content in three parts and after finishing every part, there was a small revision test. The remaining two parts were also followed by the same pattern. The experimental group was given the treatment by using the Self-instructional Modules for self-learning. The experimental group was under the observation of two instructors; students learned with the help of this Self-instructional Module. At first, the instructors explained to this group how to read and learn this module and about the revision test, which was to be taken at the end of every part. Self-instructional Modules were distributed to this group every day at the beginning of the period and collected from them at the end of the period. They were permitted to write some points if they wanted to do so.

It was continuously checked by two instructors if the experimental group read the module timings or not. Stage III—Post-test: After finishing the experiment, the same achievement test was administered to both groups as post-test.

In this study, a self-made achievement test is used in social science (Geography) with the reliability value of 0.79. For testing intelligence, the Standard Progressive Matrices Test developed by J.C. Ravens is used for this study. The coefficient of reliability of this test is 0.83. After collecting all the data on the basis of the tools, namely Intelligence test, pretest, post-test, socio-economic status scale, scoring is done by the researcher with the help of a scoring key following the manuals. The scoring provided us the raw scores. These raw scores are organised with the help of a score sheet. These scores are fed in the software of SPSS version 20 by the researcher. All the variables are entered in variable view and all the raw scores are entered in data view. After feeding all scores, data are ready for the analysis. Cronbach Alfa method, Standard Deviation, t-test and ANCOVA are used to analyse the whole data.

Result and Discussion

Objective 1: To compare the academic achievement (AA) of Class IX male and female students

Hypothesis 1: There is no significant difference in the academic achievement (AA) of Class IX male and female students.

Table 1

Comparison in Academic Achievement of Male and Female

	Gender	N	M	SD	df	t	Sig (p)
AA	Male	200	1.51	.50	318	.31**	.39
	Female	120	1.53	.50			

***P>.05*

With this objective, the achievement of gender (male and female) is compared. So Independent samples t-test is used to analyse the data. Table 1 shows that, the calculated 't' value for gender of achievement is .317 with the degree of freedom 318 as well as P value is .39, which is greater than the .05. Large 'P' value indicates that the sample provides weak evidence to reject the hypothesis for entire populations. So, the null hypothesis 1 is accepted. We can say that, there is no significant difference in academic achievement of males and females of Class IX students. The male and females have performed equally on achievement.

Objective 2: To compare the intelligence of Class IX male and female of students.

Hypothesis 2: There is no significant difference in the intelligence of Class IX male and female of students.

Table 2
Comparison in Intelligence of Male and Female of Class IX Students

	Gender	N	M	SD	Df	T	Sig (P)
Intelligence	Male	200	32.43	12.49	318	.60**	.16
	Female	120	30.50	42.33			

***P>.05*

With this objective, the intelligence of gender (male and female) is compared. Since independent samples 't' test is used to analyse the data related to this objective. Table 2 shows that, the calculated 't' value is .602 with the degree of freedom 318 as well as P value is.16, which is greater than A .05. Large P value indicates that the sample provides weak evidence to reject the hypothesis for entire populations. So, the null hypothesis 2 is accepted. We can say that, there is no significant difference in the intelligence of Class IX students in terms of gender. Male and female have equal level of intelligence.

Objective 3: To study the relationship between the academic achievement (AA) and intelligence of Class IX students.

Hypothesis 3: There is no significant relationship between the academic achievement (AA) and intelligence of Class IX students.

Table 3 shows the 'r' value is .084. This result points towards the negligible correlation between the academic achievement and intelligence. In this study, intelligence is not related to the academic achievement of ninth Class IX students. There is no significant relationship between academic achievement and intelligence.

Objective 4: To compare the effect of intelligence on post-test scores in social science (Geography) of control (Traditional teaching method) and experimental groups (Self-instructional Modules).

Hypothesis 4: There is no significant effect of intelligence on the post-test scores in social science (Geography) of experimental (Self-instructional Module) and control group (Traditional teaching method).

Table 3
Relation of Academic Achievement and Intelligence

	N	M	SD	R
AA	320	20.11	6.97	.08
Intelligence	320	31.71	27.68	

Table 4
Comparison of Effect of Intelligence on Post-test Scores of Experimental and Control Group

Groups	Mean	N	SD	Df	T	Sig(P)
Experimental	30.67	153	12.85	318	.69**	.41
Control	32.84	167	37.76			

***P>.05*

With this objective, there is a comparison of the mean of two groups, i.e., control and experimental group on intelligence. In this study, independent variable intelligence is not categorised, since independent samples t-test is used to analyse the data related to this objective. As Table 4 shows, the calculated 't' value is .69 with degree of freedom 318 as well as P value is .41 which is greater than the .05. A large P value indicates that the sample provides weak evidence to reject the hypothesis for the entire population. Therefore, null hypothesis 4 is accepted at .05 level of significance. So, we can say that there is no significant effect of intelligence on the post-test scores in social science (Geography) of control and experimental group.

Objective 5: To compare the effect of the experimental group (Self-instructional Modules) and control group (Traditional teaching method) on post-test scores in social science (Geography) by controlling the effect of pretest and intelligence scores as covariates.

Hypothesis 5: There is no significant effect of the experimental group (Self-instructional Modules) and control group (Traditional teaching method) on post-test scores in social science (Geography) by controlling the effect of pretest and intelligence scores as covariates.

Table 5
Descriptive Statistics for Group on Post-test Scores

Group	Mean	SD	N
Control	16.19	5.74	153
Experimental	23.70	6.01	167
Total	**20.11**	**6.97**	**320**

Table 6
ANCOVA Summary for Group on Post-test Scores

Source	Sum of square	Df	Mean Square	F	Sig (p)
Group	3462.40	1	3462.40	121.65*	.00
Pre	1856.48	1	1856.48	65.22	.00
Intelligence	101.00	1	101.00	3.54	.06
Error	8963.82	315	29.83		.
Total	**144964.00**	**320**	**28.45**		

**P<.05*

With this objective, independent variable group has two levels—control and experimental group; dependent variable achievement is post-test scores. The effects of pretest and intelligence scores are controlled as covariates, since one way analysis of covariance is used to analyse the data related to this objective.

As Table 6 shows, the F value is 121.65 for the group with degree of freedom 1/315 and P value is .00 which is lesser than .05. Low P value indicates that the sample provides enough evidence to reject the hypothesis for entire populations. Therefore, null hypothesis 5 is rejected at .05 level of significance. So, we can say that, there is a significant effect of control and experimental group to post-test scores in social science (Geography) by controlling the effect of pretest and intelligence scores as covariates. As we can see, the covariate pretest shows significant differences between control and experimental group because of low P value (.00 than .05). Intelligence shows no effect of intelligence on control and experimental group because of large P value (.06 than .05).

Experimental group post-test means scores are 23.70, which is higher than control group post-test scores i.e., 16.19 as Table 5. Experimental group performed better than the control group. Experimental group (Self-instructional Modules) is found to be more effective than a control group (Traditional teaching method) in social science (Geography) in controlling the effect of pretest and intelligence scores as covariates.

Findings of the Study

1. There is no significant difference in academic achievement in terms of gender. Boys and girls performed equally on academic achievement.
2. There is no significant difference in intelligence in terms of gender. Boys and girls have equal intelligence.
3. There is no significant relationship between academic achievement and intelligence (Dhull 2011) and Naderi, et al., (2008).
4. There is no significant effect of intelligence on post-test scores in social science (Geography) of control (Traditional teaching method) and experimental groups (Self-instructional Modules Intelligence is not found to be effective for the experimental group (Self-instructional Modules).
5. Experimental group (Self-instructional Modules) is found to be more effective than a control group (Traditional teaching method) in social science (Geography), in controlling the effect of pretest and intelligence scores as covariates.

Conclusion

In this study, gender neither influences the academic achievement nor the intelligence of secondary school students. We can facilitate our

students with this Self-instructional Module to help in their concepts clearing, which will help them to increase high achievement. At the present time, equal opportunity is being provided to learn at home; coaching and equal chance is being provided to improve their mental abilities. That is why females perform equally well and have equal intelligence. Intelligence is not working as correlates of academic achievement in this study. Similarly, Self-instructional Modules is found to be more effective than traditional teaching method even if it has low intelligence of experimental group than the control group.

It means increasing achievement does not increase in intelligence as well as decreasing achievement does not show a decrease in intelligence. Like that; 'High academic performance is not possible in the absence of intelligence, but then there is no guarantee if high intelligence, then performance will also be higher' (Patel, 2011).

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