

## USING GOOGLE SKY TO TEACH SOME BASIC ASTRONOMICAL CONCEPTS- AN EXPERIMENTAL STUDY

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**Abstract:** Astronomy is the study of celestial bodies. It had a prominent position over the other branches of knowledge during the Vedic times. In spite of the efforts made through formal as well as informal educational activities, still there are many misconceptions regarding various astronomical phenomena among Indian students. Google sky, an application created by Google contains images and podcasts and they can provide real-like experiences in selected categories of astronomical objects. As the present study was intended to study the effect of using Google Sky to teach some basic concepts of Astronomy, the investigator adopted Experimental method. Pre-test Post-test Non-equivalent group design was followed. The experimental group was taught using Google Sky and the control group using Activity Oriented Method. The sample selected included 90 students studying in Standard VIII of Pathanamthitta district in Kerala. The investigator prepared and standardized an Achievement Test on some basic concepts in Astronomy like Solar System and Star Constellations. It was found that usage of Google Sky for teaching Astronomy is more effective than Activity Oriented Method on the total achievement in Astronomy of secondary school students. It is hoped that this study will inspire curriculum planners and teachers to use such innovative technologies to help students to learn Astronomy in an effective, meaningful and interesting way.

**Key Words:** Astronomy, Google Sky, Activity Oriented Method

### 1. INTRODUCTION

“Like the crests on the heads of Peacocks, Like the gems on the hoods of Cobras, Jyotisa (Astronomy) is at the top of Vedanga Sastras- the auxiliary branches of Vedic knowledge”. - Vedangajyotisa, 4

From the above verse, it is evident that Astronomy had a prominent position over the other branches of knowledge during the vedic times. Astronomy is the study of celestial bodies. This science includes information about the planet where human beings live on - Earth- and all the neighbors in space [1]. It finds immense practical applications in chronology, season determination, agriculture, communication, remote sensing, education, navigation, trade, commerce, weather forecasting and above all as a source of inspiration for many artifacts and creative

expressions. Astronomy is an interdisciplinary subject which can build the gap between other subjects. By practicing astronomical observations and calculations, a person knowingly or unknowingly gets trained in scientific method also. Astronomy develops scientific literacy, critical thinking skills and science process skills [2].

#### 1.1 Google Sky

Google sky is an application created by Google. Earlier it was an extension of Google's Google earth. In response to the popularity of Google sky application in the Google Earth, Google sky website was launched in March 13, 2008. It is accessible from any web browser and operating system and is available in 26 languages. Its URL is, <http://www.google.com/sky> [3].

It includes the following categories as thumbnail images at the bottom of the screen:

- Solar System
- Chandra X-Ray showcase
- Constellations
- Galex Ultraviolet showcase
- Hubble showcase
- Spitzer Infrared showcase
- Backyard Astronomy
- Earth and sky podcasts

If the student selects the Solar System category, at the bottom of the screen, images of all planets will appear. By selecting each planet, the exact location of the planet in its orbit in UTC time can be found out. On clicking the constellation category, shapes of Constellations in the sky can be seen. The images captured by the Hubble telescope can be seen by selecting Hubble showcase category. Also the description about it will appear if it is selected. In the Galex, Chandra and Spitzer showcases, one will get the information in the same manner. In the “Earth and Sky Podcasts”, one can hear 90-second podcasts and read information related to important astronomical events. The images are made by linking the images from NASA satellites, the Sloan Digital Sky Survey (SDSS) and Hubble Telescope.

## 1.2. Need and Significance of the Study

In India, Astronomy has been made a part of Physics education. In spite of the efforts made through formal as well as informal educational activities, still there are many misconceptions regarding various astronomical phenomena among Indian students. The studies conducted by Samarapungavan et al.[4], Padalkar and Ramadas[5], Venkatesaran [6] and Rakhy [7] reveal this. Only through careful planning of the

curriculum and use of efficient resources on Astronomy, Astronomy learning can be made a successful venture.

Astronomy is basically an observational Science. Nobody can touch, feel or smell any astronomical objects. Only that can be done is to give sky gazing sessions at day and night. Giving night sky star gazing session is practically impossible in schools as giving night class sessions are difficult. But, one can provide observations through Telescopes during day time and arrange trips to Planetariums. But both of these will create economic burden to the schools. In essence, to give students Astronomy related direct experiences are practically impossible. In order to counter these limitations, resources which can provide real like experiences in the classroom itself should be encouraged. Google sky is one such web based application which can provide real like experiences to the students in the classroom itself with the help of a projector or a computer screen. It can be made available on internet enabled mobile phone also.

On analysing the studies on using Google Sky it was found that there were only very few studies in this area. The details of the studies are given as follows. Sara and Laura [8] presented in their study three different uses of Google Sky's content through a warm-up exercise, jigsaw activity and scavenger hunt to spark and further expand teacher and student interest in this tool. In a study conducted by Andrew [9], he used Google Earth and Sky to introduce Astronomy in classrooms, after school programs and families. In another study by Landsberg et al. [10], the capabilities of Google Sky and World Wide Telescope to create compelling and participatory educational experiences in both formal and

informal settings were examined. On reviewing the research literature in teaching of Astronomy extensively, it was observed that this way of teaching Astronomy in particular, has not attracted the researchers so far to investigate their effectiveness, usefulness and validity in enhancing the academic achievement of students. Since the subject of Astronomy occupies an important place in school curriculum there is a need to probe the effectiveness of using Google Sky on achievement in Astronomy. Hence the investigator has selected this topic for the present study.

### 1.3. Statement of the Problem

As this study was intended to find the effect of using Google sky in classrooms to teach some basic concepts of Astronomy, the study is entitled,

**“Using Google Sky to teach some basic concepts of Astronomy-An Experimental study”.**

### 1.4. Operational Definition of Key Terms

**Google sky:** It is an application of Google which will allow its users to see the sky as well as various astronomical objects by clicking the thumbnails in the screen.

**Basic Concepts of Astronomy:** Astronomy is the study of celestial bodies and the phenomena associated with it. The basic concepts of Astronomy include the concepts like Sun, Moon, Earth, Solar System, Star Constellation, Galaxies etc. In this study, “Basic concepts of Astronomy” means the concepts related to Solar System and Star constellations.

**Experimental Study:** A study in which at least one independent variable is manipulated and its effect on another dependent variable is studied.

### 1.5. Objectives of the Study

- To find out the effect of using Google Sky and Activity Oriented Method to teach some basic concepts of Astronomy to secondary school students.
- To compare the effect of using Google Sky and Activity Oriented Method on achievement in Astronomy of secondary school students.

## 2. METHODOLOGY

As the present study was intended to study the effect of using Google Sky to teach some basic concepts of Astronomy, the investigators adopted Experimental method. Pre-test Post-test Non-equivalent group design was followed. The experimental group was taught using Google Sky and the control group using Activity Oriented Method. The population was Standard VIII students studying the High schools of Kerala following Kerala State Syllabus. The sample selected included 90 students studying in Standard VIII of Pathanamthitta district in Kerala. The tools used were,

1. Lesson Transcripts based on Google Sky
2. Lesson Transcripts based on Activity Oriented Method
3. Achievement Test in Astronomy (on some basic concepts of Astronomy) (prepared and standardized by the investigator)

## 3. PROCEDURE ADOPTED FOR THE STUDY

As there were no standardized tools available to measure achievement in some basic astronomical concepts, the investigator prepared and standardized an Achievement Test on some basic concepts in Astronomy like Solar System and Star Constellations strictly following the principles of Test construction and

item analysis. It consisted of 25 Objective type questions on the topics selected. Before preparing the test, the investigator thoroughly analysed the content area and adequate weightage was given to the content as well as the instructional objectives. Opinion of the experts and teachers in this field were also collected for preparing the test. These all ensured the Content validity of the test. The investigator found out the Coefficient of Correlation between the scores obtained using the achievement test and the scores of the First terminal examination of the students. It was found to be 0.8912. This value shows that this test has good empirical validity. For establishing reliability, the investigator used Split Half method and the reliability was found to be 0.7891. This shows that the test has high reliability.

The sample selected was divided in Experimental and Control groups and their achievement in Basic concepts of Astronomy was found through a Pre-test. Then the experimental Group was taught using Google Sky and the Control group through Activity Oriented Method. After the experiment, the tool (Achievement Test in Astronomy) was readministered as Post-test. The Pre-test and Post-test scores were tabulated and subjected to statistical analysis.

#### 4. ANALYSIS AND INTERPRETATION OF DATA

The data collected were analyzed to throw light on the objectives of the study. Analysis and Interpretation of results have been presented under the following heads.

##### 4.1. Comparison of Experimental and Control groups on Achievement in Astronomy as a whole based on pre-test and post scores

To understand the performance of students in the Experimental and Control groups, an Achievement Test in Astronomy was conducted and its scores were analysed. The analysis done regarding this subsection is shown under the following heads.

##### Analysis of comparison of scores on pre-test and post-test on Achievement in Astronomy of Experimental and Control groups using 't' test:

The effectiveness of using Google Sky on Achievement in Astronomy was found out by comparing the mean pre-test and post-test on Achievement in Astronomy of Experimental and Control groups using 't' test. The Data and Result of Test of significance of difference are given in Table 1.

Table 1. Data and result of test of significance of difference between the mean scores on pre-test and post-test on achievement in astronomy of experimental and control groups

Scores	Groups	N	Mean	SD	CR	Level of significance
Pre-test	Experimental	45	2.34	0.91	0.105	P>0.05
	Control	45	2.36	0.99		
Post-test	Experimental	45	19.55	1.82	7.89	P<0.01
	Control	45	15.90	2.52		

The analysis of the pre-test scores on Achievement in Astronomy shows that the critical ratio obtained is 0.105 which is not significant at 0.01 and 0.05 levels. It means that there is no significant difference in the level of achievement in Astronomy of experimental and control group prior to experimental treatment.

After comparing the post - test scores (CR=7.89) of the Experimental and Control groups with respect to Achievement in Astronomy, it is revealed that the Experimental and Control groups differ significantly at 0.01 level. The value of critical ratio and the mean score reveals that students in the Experimental group achieved better than the Control group. Thus it can be inferred that the teaching through Google Sky helped the Experimental group to achieve better than the Control group.

#### **Comparison of the scores on Achievement in Astronomy of Experimental and Control groups using Analysis of Variance:**

In this part, the total sum of squares, mean square variance and 'F' ratio for the pre-test and post-test scores on Astronomy Achievement of the Experimental and the Control groups were computed. The analysis of variance for the pre-test scores (x) and the

post-test scores (y) of students of both the groups are presented in Table 2.

The obtained value of  $F_x$  is 0.01 which is not significant. It shows that there is no significant difference between pre-test scores of Experimental and Control groups with respect to their Astronomy Achievement. The obtained  $F_y$  value is 62.42 which is significant at 0.01 level. This shows that the groups differ significantly on Achievement in Astronomy in the post-test scores. So the pre-test and post-test scores obtained on Achievement in Astronomy were subjected to ANOVA.

#### **Comparison of the pre-test and post-test scores on Achievement in Astronomy of Experimental and Control groups using Analysis of Covariance.**

The above computations were carried out for the purpose of correcting the post - test scores (y) for the difference in the pre - test scores (x). The adjusted Sum of Squares and Adjusted Mean Square Variance for post-test scores were computed and F ratio was calculated. So ANCOVA was adopted for further computation. The results of analysis are presented in Table 3.

Table 2 Summary of analysis of variance of the pre-test and post-test scores on achievement in astronomy of the experimental and control groups

Source of Variation	df	SSx	SSy	MSx	MSy
Among means	1	0.01	300.7	0.01	300.67
Within groups	88	78.64	423.9	0.89	4.82
Total	89	78.66	724.6		

$$F_x=0.01; F_y=62.42$$

Table 3 Summary of analysis of covariance of the pre-test and post- test scores on astronomy achievement of the experimental and control groups

Source of variation	df	SSx	SSy	SSxy	SSyx	MSyx	SDyx
Among means	1	0.01	300.7	1.83	297.88	297.88	
Within groups	87	78.64	423.9	59.18	379.38	4.36	2.09
Total	88	78.66	724.6	61.01	677.26		

$$F_{yx} = 68.31$$

Since the  $F_{yx}$  ratio (68.31) is greater than the table value, it is significant at 0.01 level. The significant  $F_{yx}$  ratio for the adjusted post-test scores on Achievement in Astronomy shows that the final mean (post-test) scores of students in the Experimental and Control groups differ significantly after they were adjusted for the difference in the pre-test scores.

## 5. EDUCATIONAL IMPLICATIONS OF THE STUDY

The present study has got implications in the teaching-learning process and curriculum development. Since the present study revealed that, Using Google Sky is more effective than the Activity Oriented Method on achievement in Astronomy, teachers should be encouraged to use this way of teaching Astronomy. Since the application of Google Sky facilitates better learning, it should be given more place in the curriculum. The curriculum designers should be given awareness about the significance and need of the drastic changes in Astronomy teaching. The education departments can organize training in using web sites and softwares related to Astronomy.

## 6. CONCLUSION

From this study it can be concluded that usage of Google Sky for teaching Astronomy is more effective than Activity Oriented Method on the total achievement in Astronomy of secondary school students.

In order to regain the prestigious position enjoyed by Astronomy in the Vedic period and thereby free mankind from superstitions and misconceptions, Astronomy education should be made an integral part of the curriculum. Through this study it was evident that by using Google Sky for learning Astronomy, the achievement in Astronomy can be increased. So the officials should take necessary steps to incorporate these types of innovative technologies to equip the future generation with sufficient knowledge to understand the cosmic roots and feel the beauty of this universe. It is hoped that this study will inspire curriculum planners and teachers to use such innovative technologies to help students to learn Astronomy in an effective, meaningful and interesting way.

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# Using Google Sky to Teach Some Basic Astronomical Concepts - An Experimental Study

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