International Journal on Arts, Management and Humanities **7**(1): 124-127(2018)

ISSN No. (Online): 2319–5231

A Study on the Effectiveness of Declarative, Procedural and Conditional Knowledge for Physics among Higher Secondary Students with Reference to the 5E Teaching Learning Model

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(Received 17 February, 2018, Accepted 24 April, 2018)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Metacognition is considered the most determining factor in the students. Learning specialist's believes that it is possible to teach the students many metacognitive skills effective on learning and its transference. The 5E teaching learning model is undertaken in five phases, the increasing of student engagement, the ability to understand concept, breakdown the concept, explain the case theory.
Hence metacognition, as a high level mental process, is associated with problem solving skills. 5E teaching learning, as an established planning model in physics, is consistent with contemporary theories about how individual learn.

Keywords: Higher secondary students, Metacognition, Physics, 5E teaching learning model.

I. INTRODUCTION

The term, metacognition, first came out as the result of a research on children's memory processes, carried out by Flavell and the others [6]. Metacognition as multi-dimensional set of skills that involved "thinking about thinking" [9]. Metacognition involves two main components: knowledge about cognition and regulation of cognition [6]. Knowledge about cognition includes knowledge about oneself as a learner and about the factors that might impact performance(declarative), knowledge about strategies(procedural), and knowledge about when and why to use strategies(conditional). Regulation of cognition is the monitoring of one's cognition and includes planning activities, monitoring or awareness of comprehension and task performance, and evaluation of the efficacy of monitoring processes and strategies. These regulatory activities associated with solving problems are called metacognitive skills [2].

The 5E teaching learning model is based on a constructivism view and most effective way of engaging student's in learning [11, 3, 4]. This model consists of five phase; engage, explore, explain, elaborate and evaluate. First it is provided that students are engaged in the concepts through a short activity or relevant discussion. Next students explore the concepts with others by developing a common set of experiences. In explain, the teacher guides the students to develop an explanation for the concepts they have been exploring. In elaborate the students expand their understanding of apply what they have learned in a new setting. In evaluate the students and the teachers have an opportunity to evaluate the students understanding of the concepts [4].

5E model approaches to encourage interaction between teachers and students and to help students take more responsibility for their learning [1]. In the classroom, students applied their learning through a variety of student centered activities including solving problems, discussion on concepts with their peers. The results showed that most of the students experienced a significant gain in their ability to understand, apply and analyzing the concepts. In physics, 5E teaching learning model approach great achievement, better retention of concepts, improved attitude, improved reasoning ability and superior process skills [5].

Objectives of the Study

(i) To study the effectiveness of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model.
(ii) To study the effectiveness of procedural knowledge for physics among higher secondary students with reference to 5E teaching learning model.
(iii) To study the effectiveness of conditional knowledge for physics among higher secondary students with reference to 5E teaching learning model.

Hypothesis of the study

(i) There will be no significance difference between the pre-test score and post test score of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model.

(ii) There will be no significance difference between the pre-test score and post test score of procedural knowledge for physics among higher secondary students with references to 5E teaching learning model.

(iii) There will be no significance difference between the pre-test score and post test score of conditional knowledge for physics among higher secondary students with references to 5E teaching learning model.

II. METERIALS AND METHOD

In this study to find the study on the effectiveness of declarative, procedural and conditional knowledge for physics among higher secondary students with reference to the 5E teaching learning model. So the researcher use the following materials and method-

(a) Methodology- Keeping in mind the present research, the research has been used experimental method to conduct this study.

(b) Tools and Techniques- Various devices are used for collecting new unknown data required for the study of any problem for each and every type of research. The following tools was used by researcher to conduct this study, they are: Questionnaire, Interview, Reflection essay, Metacognitive Skill Inventory (MSI) [10].

(c) Sample of the study- The sample of the study consisted of 400 students of higher secondary students of Maharashtra state. The sample was taken from different division of Maharashtra i.e. Vidarbha, Khandesh, Maratwara and Pac him Maharashtra. The selection of schools was done on Random Basis by lottery system.

(d) Statistical technique –statistical techniques such as mean, standard deviation and t-test were used for the study [7, 8].

III. RESULTS AND DISCUSSION

The important results that have emerged out after analysis and interpretation of data are given below-

Objective 1: To study the effectiveness of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model.

	Pre-Test	**Post-Test**
Mean	2.51	5.68
Standard Deviation	1.22	1.40
t-value	35.22	
df	399	
t-value on 0.01 level	2.59 Significant Difference	
t-value on 0.05 level	1.97 Significant Difference	

For 399 df calculated t-value may be more than 2.59 on 0.01 levels for significant. In present hypothesis calculated `t' value is 35.22. It means calculated 't' value is more than table value. So that hypothesis no. 1 is significant and null hypothesis is rejected.

Hypothesis 1: There will be no significant difference between the pre-test score and post test score of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model.

For 399 df null hypothesis regarding pre-test score and post test score of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model was rejected on 0.01 level of significant. On this we are say that there is a significant difference between the pre-test score and post test score of declarative knowledge for physics among higher secondary students with reference to 5E teaching learning model and effect of declarative knowledge with reference to 5E teaching learning model for physics is positive. It means when researcher used 5E teaching learning model, in teaching of physics its impact on students learning of Physics is positive and students earn more declarative knowledge in physics.

Objective 2: **To study the effectiveness of procedural knowledge for physics among higher secondary students with reference to 5E teaching learning model.**

	Pre-Test	**Post-Test**
Mean	1.88	3.00
Standard Deviation	0.75	0.81
t-value	18.67	
df	399	
t-value on 0.01 level	2.59 Significant Difference	

t-value on 0.05 level	1.97 Significant Difference

Observation:

For 399 df calculated t-value may be more than 2.59 on 0.01 levels for significant. In present hypothesis calculated 't' value is 18.67. It means calculated 't' value is more than table value. So that hypothesis no. 2 is significant and null hypothesis is rejected.

Hypothesis Testing:

Hypothesis 2: There will be no significant difference between the pre-test score and post test score of procedural knowledge for physics among higher secondary students with reference to 5E teaching learning model.

For 399 df null hypothesis regarding pre-test score and post test score of procedural knowledge for physics among higher secondary students with reference to 5E teaching learning model was rejected on 0.01 level of significant. On this we are say that there is a significant difference between the pre-test score and post test score of procedural knowledge for physics among higher secondary students with reference to 5E teaching learning model and effect of procedural knowledge with reference to 5E teaching learning model for physics is positive. It means when researcher used 5E teaching learning model in physics teaching, its impact on students learning of Physics is positive and students earn more procedural knowledge in Physics.

Objective 3: To study the effectiveness of conditional knowledge for physics among higher secondary students with reference to 5E teaching learning.

	Pre-Test	**Post-Test**
Mean	2.17	3.78
Standard Deviation	1.00	0.99
t-value	23	
df	399	
t-value on 0.01 level	2.59 Significant Difference	
t-value on 0.05 level	1.97 Significant Difference	

Observation:

For 399 df calculated t-value may be more than 2.59 on 0.01 level for significant. In present hypothesis calculated't' value is 23.00. It means calculated't' value is more than table value. So that hypothesis no. 3 is significant and null hypothesis is rejected.

Hypothesis Testing:

Hypothesis 3: There will be no significant difference between the pre-test score and post test score of conditional knowledge for physics among higher secondary students with reference to 5E teaching learning model.

For 399 df null hypothesis regarding pre-test score and post test score of conditional knowledge for physics among higher secondary students with reference to 5E teaching learning model was rejected on 0.01 level of significant. On this we are say that there is a significant difference between the pre-test score and post test score of conditional knowledge for physics among higher secondary students with reference to 5E teaching learning model and effect of conditional knowledge with reference to 5E teaching learning model for physics is positive. It means when researcher used 5E teaching learning model in physics teaching, its impact on students learning of physics is positive and students earn more conditional knowledge in Physics.

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