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The Effect of Concept Attainment Model on the Academic Achievement of Physics Students on Secondary Level in Balochistan

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Abstract

The Concept Attainment Model (CAM) is a method which involve student to define the topics from their own self giving reasonable examples and evidence based analyzing the concepts through this model". Students have critical skills development and have the ability of analyzing different things. This Model is intended to teach specific concepts by comparing and contrasting examples that contain the concept and that do not contain the concept. The purpose and objectives of the study was to check the effect of Concept Attainment Model (CAM) and compared with tradition method of teaching in teaching physics at secondary leave using the Pre and Post assessment. Students understanding Physics concept, building were assessed by the multiple choice questioners. The data showed that student's level of understanding of the concepts and critical thinking skills did increase with the use of the concept attainment model. The Concept attainment model is an effective teaching method to engage students in creating their own definition. The lesson helped to increase understanding of the concept and link the concepts, engages students to know and think about the learning with positive effect on their attitude and motivation in class, finally CAM is the most effective model for conceptual understanding and for critical thinking in Physics.

Keywords: Concept Attainment Model (CAM), Critical Thinking Skill, Analyzing Skills

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Introduction

The teaching learning process is very important for educational development. It is the key to success and progress of individuals if properly planned and directed. Teaching is a process of showing or helping individual to know how to do something, guiding in learning something, giving instructions, providing with knowledge causing to know. It involves managing instructional facilities as well as equipment provision and managing learning resource materials to meet the students' needs. Successful and effective teachers are educators who have the capacity to enhance the potential and capabilities of students within the classroom. "in current time, teachers should pay a variety of dynamic teaching approaches to encounter the current requirements and they should be proficient and skilled in implementing these approaches" (Joyce et al., 2008). Patel (2019) has cited Ukeje (1998) that the "teaching is a process of giving guidance by which learner is prepared to grasp facts and ideas and to develop skills. With the change of society teachers are required to improve and modify their roles with respect to students' needs, demands of school curriculum and emerging concerns of the society. In today's world, the core purpose of teaching is to enable individuals to acquire the skills of learning, expressing gratitude, exploring and asking questions.

In Concept Attainment Model (CAM) our teacher plays different roles. The main responsibility of a teacher is to provide examples, record student's data and to ask probing questions. Teacher motivates students to utilize their cognitive process at their highest potential by using the best instructional strategy. He presents the data to students. He develops a plan and guides learners. The main objective of teacher is to help learners in provision of concepts. Likewise, student's workout the attributes of category or group that has been presented by the teacher. Students are expected to evaluate and identify the differences and similarities between samples that have the qualities of the concept and samples that do not have those qualities. "Concept Attainment Model (CAM) may create the power of reasoning in students. It may enhance student's ability of imagination. Students learn to analyze things systematically during the process of the teaching learning through CAM". Students remain activity engaged. It may help students to apply their knowledge in a variety of situations. Students can work together in a corporative group to share information. CAM engages the pupils in making their individual

meaning of an idea by examining the qualities of various positive and negative examples of concept or topic. Likewise, there are some demerits of concept attainment model. A student may go on thinking wrong and he may generate a wrong hypothesis during this teaching learning system. Some students may remain absent minded in the classroom. Similarly, all the students may not be able to participate in this process. The students may not be able to generate new concepts.

To achieve effective information processing it is important to adopt a teaching theory that outlines methods for maximizing learning to achieve desirable learner's behavior, acquiring knowledge, enhancing intellectual development and emphasizing exact intellectual skills like mental, deductive thinking, logical analysis, and systematic imagination. According to Branford, Brown and Cocking (1999 as cited learn, 2000). Teacher presenting feedback reliably on students regarding their understanding which helps the students conceptual and practical practice and knowledge in physics that is why it is necessary to own and adopt new teaching strategies to take command on physics concepts and make it interesting and well organized.

Problem Statement:

The effect of concept attainment model on achievement of physics students on secondary level in Balochistan, teaching of physics needs special teaching methods. It has been felt that in spite of active efforts of physics teacher, students fail to grip the certain concepts of subject, which lead disinterest among students towards physics. More over students are often unable to apply and link their knowledge to advance studies. Therefore, there is a need to study the effectiveness of the teaching methods in physics the study will be an experiment for the facts collection from one school in Quetta district

Objectives:

The objectives of the research study as below:

i. To Compare academic achievement of students taught with concept attainment model and without concept attainment model.

Literature Review

Teaching models refer to specific teaching approaches that are designed to achieve specific instructional goals. The teaching model

informs about the nature of concept as well as informs strategies to acquire them (Galotti, 2000). A teaching model is a useful tool that aids teachers in enhancing their teaching efficiency and effectiveness, making the teaching process more interesting and structured. “the teaching CAM model is intended to acquire concepts efficiently and easily”. (Bhaskara, 2018). There are different models of teaching and learning such as Concept Attainment Model (CAM) if used properly it may create more appropriate learning environment and stimuli as well for students to solve their problems regarding to the subject. Basically, this CAM Model is developed to impart various ideas and to help learners to develop additional active and efficient at learning. Teaching models are designed to impart strategies that should be integrated into teaching practices. “Higher order thinking skills (HOTS) is the capability to attain target goals through various forms of rational procedure. HOTS refers to cognitive processes that go beyond simple memorization and comprehension and involved more advanced mental activities”. These skills are critical for problem solving, critical thinking and complex decision making conferring to bloom’s taxonomy study, synthesis and evaluation are the advanced instruction thinking skills. Analysis is the skill to breakdown multifaceted information into simpler parts and understand the relationships between those parts. Synthesis is the capacity to combine different ideas, concepts, or information to create new insights or solutions. Evaluation is the skill of assessing the quality, value, and credibility of information, arguments, or solutions. As per the revised Bloom’s taxonomy the level of higher order thinking skills are analysis, evaluation and creating it means synthesis is replaced with creating skill. Higher order thinking skills are essential in education and various professional fields because they enable individuals to think more deeply, make informed decisions, and adapt to complex and rapidly changing situations. The CAM is an education model that belongs to info processing models. The concept attainment impression was established by J.S. Bruner and his collaborators Goodnow and Austin in their book “a Study of Thinking “, published in 1956”. The main purpose of CAM is to enhance students' conceptual learning efficiency and effectiveness by teaching them organizing concepts for information. Concept Attainment Model (CAM) is a teaching method to understand new impression based on contrasting and comparing various qualities of the idea. This model is based on Bruner's work on categorizing which is a cognitive activity. According to him classifying assistances to decreasing the

difficulty of setting necessary for idea understanding.

The concept attainment model (CAM) of teaching comprises of three phases. In the first phase, teacher offerings categorized examples. Then students are asked to compare qualities between these exemplars and non-examples. Following that, students create and test hypothesis and eventually state definitions based on essential attributes. Moving to the second phase, students identify additional labeled examples as either 'Yes' or 'No'. Then teacher validates their hypothesis, assigns names to concepts and reaffirms definitions based on essential attributes. During the third phase students generate some new examples, elaborates on their thought processes and attributes. Finally, students discuss the types and number of hypothesis they have formulated.

Structural Framework of Concept Attainment Model (CAM)

The CAM has following four elements (1) focus: the main aim of the CAM is to improve the ability of inductive reasoning of the learners. For this purpose, different examples are presented and students identify the quality or common characteristics of person or things and then they put them into categories. (2) Syntax: it comprises of 3 phases. During first phase data is presented and qualities of concept is identified. In it teacher presents labeled (Yes/No) examples. Afterwards learners are instructed to identify and compare attributes of examples and non-examples. After that students make hypothesis. Then they formulate a definition of concept in their own words according to the essential attributes. Afterwards teacher confirms hypothesis, names and concepts of students. He refines the definition according to the essential attributes. Then students analyze their skills regarding concept attainment. (3) Social system: In CAM teacher plays a vital role. He motivates learners as well as guides them for making and analysis of concepts. He builds (Yes and No) examples of concepts. He presents these examples with clear attributes. (4) Support System: During this data are presented with examples and non-examples. Afterwards learners describe their attributes. During this educator can keep best or note the qualities. In doing so, teacher can support and help students through this way.

As per Lekha (2000) cited by Alam (2017) the concept of Mathematics can be teaching through concept attainment model (CAM) which is effective as compare to traditional approach at secondary level. Furthermore, Alam (2017) has cited Streelekha and Nayar (2004) escribing that the CAM is most effective in improving the concept in chemistry. Moreover, Alam (2017) also cited Shamnad (2005)

describing that Concept Attainment Model (CAM) are effective as compare to traditional in teaching Arabic grammar at secondary level school. Same wise Noreen and Chaudhary (2021) described that concept attainment model is most effective in teaching of economics improving the students understanding and engagement. Singh (2011) has recommended that CAM is overall effective in improving the ability of reasoning in science subjects. Mayer (2012) "incorporated the CAM of teaching along with inductive reasoning to teach secondary level physics. He found that the utilization of CAM enhanced the students' comprehension of concept and their cognitive abilities". Kumar and Mathur (2013) "studied and evaluated the effectiveness of CAM on learning of Physics concept at secondary level and found it effective". Manvi and Giri (2014) "evaluated the usefulness of CAM for promoting achievement of English concept and retention of concepts at secondary level and found the CAM very useful as compared to conventional method. In his research study." Patel state that reported that CAM of teaching for chemistry is more effective than traditional method at secondary school level". Nivedita and Rani Conducted a research study and compared memory model and CAM with conventional teaching method for teaching English grammar. These both models of teaching were found more known in effective as compared to conventional method for promoting achievement score in English grammar". Bhargava (2016) in his research study conducted that CAM is effective for social sciences. Yuliati et al (2017) on page 104 "Studied the effect of physics learning using discovery learning and CAM on problem solving ability". They found that the problem solving ability of students who are taught using CAM is higher than that using discovery learning model.

Hypothesis

There is no significant effect of concept attainment model on the academic achievement of physics students of class 9^{th} at secondary level.

Methodology

In the start of this experimental study, all the students of class IX of experimental group and control group are specified pretest of the-selected - physics topics to check the learning ability of the both two groups which found equal. After that the group A was taught by Concept Attainment Model (CMA) with using concept map, pictures, puzzle games of yes exemplar and Non exemplar question using audio visual aids but the Group B was taught

by the traditional method using lecture method. Two groups were taught on the separate day with equal time period as per lesson plan after that, posttest recorded of the treatment and non-treatment groups. The Questioner for both groups treatment and non-treatment groups were comprised of 10 questions after that the result data analyzed accordingly.

Population

This Concept Attainment Model (CAM) study conducted in Balochistan; Quetta district is the capital of Balochistan with an estimated population of 1000 students in 25 Boys Govt secondary level school. For the purpose of this study, the population comprised 1of the 25 Secondary levels for that Govt Sandmen high school selected for the experiment.

Administration of Tool/Tools

Pre and Post-test will be weightage equally each question will be of 5 marks.

Analysis of Data

The data and result achieved from Pre- test and Post - test analyzed with the help of Descriptive Statistics. After that all the data presented in graphical and tabular shape with all necessary fact and narrations and Statistical techniques applied as necessary.

Sample of the Study

In the research study convenient type of sampling procedures will adopt to select the sample. The universe from which the sample select will be 9th grade physics students of GBHS Sandmen Quetta city in school.

Development of tools

i) Preparation of Lesson Plans for the Class IX physics keeping in view the Concept attainment model.
ii) Preparation of the Pre-test and Post-test.
iii) Preparation and arrangement of the necessary teaching materials for the CAM model.

Results

Table 1. *Data analysis for the Post test of Experimental group and Control group*

Group	N	Mean	Std. Division	t	Df	Sig(p)
Control group Post	25	12.4	15.66	5.158	24	2.7861E-05
				-5.158	24	2.7861E-05
Experimental group Post	25	18.52	9.926			

Table 1 shows that there is reasonable improvement and change in the students of experimental group (M=18.52, SD= 9.926) as compared to the control group (M=12.4, SD=15.66). A significant difference was found between the post tests of control and experimental group.

Table 2. *Comparison of Pre and Post of Experimental Group*

Group	N	Mean	Std. Division	t	Df	Sig(p)
Experimental group Pre	25	11.36	20.32			
				9.693	24	8.99844E-10
Experimental group Post	25	18.52	9.92			

Table 2 Data analysis of Pre and Post of Experimental group in which CAM pre score is 11.36 and CAM post score is 18.52 with reasonable change and improvement. There is a highly significance difference in data.

Discussion

The main objectives of the research study to compare the academic achievement of students taught with the concept attainment model (CAM) and without concept attainment model (CAM) with following the hypothesis "There is no significant effect of concept attainment model on the academic achievement of physics students of class 9^{th} at secondary level". As per the data analysis there is a significant influence of concept attainment model on students as result analyzed in Table 1 shows that there is reasonable improvement and change in the students of experimental group (M=18.52, SD= 9.926) as compared to the control group (M=12.4, SD=15.66). The significance value was

also high. Furthermore, the research findings supported the previous researches". Mayer (2012) "incorporated the CAM of teaching along with inductive reasoning to teach secondary level physics. He found that the utilization of CAM enhanced the students' comprehension of concept and their cognitive abilities". Kumar and Mathur (2013) "studied and evaluated the effectiveness of CAM on learning of Physics concept at secondary level and found it effective". Habib (2019) reported that CAM is additional actual than traditional method in education of Arabic grammar at secondary school level. Bhargava (2016) study of concept attainment Model on social studies achievement in which Bhargava has referenced Kelani (2008) for the retention of science concept as per the result CAM is most effective and significant in both teaching and retention for both purpose.

Manvi and Giri (2014) "Evaluated the usefulness of CAM for promoting achievement of English concept and retention of concepts at secondary level and found the CAM very useful as compared to conventional method. In his research study" Patel (2014) "reported that CAM of teaching for chemistry is more effective than traditional method at secondary school level". Noreen (2021) study on enhancing understanding ability of economics concept through concept attainment modeling of learning quoted Nivedita and Rani (2015) memory model and CAM with conventional teaching method for teaching English grammar. These both models of teaching were found more known in and effective as compared to conventional method for promoting achievement score in English grammar. Bhargava (2016) in his research study conducted that CAM is effective for social sciences. Yuliati et al (2017) on page 104 Studied the effect of physics learning using discovery learning and CAM on problem solving ability". They found that the problem solving ability of students who are taught using CAM is higher than that using discovery learning model.

Conclusion

The Concept Attainment Model (CAM) has confirmed the significant achievement in the improving of learning specially applying in physics. The application of CAM model has increased the analytical and learning of physics concepts with deeper understanding. Furthermore, as per the findings the CAM is effective in all other subjects which develop the critical thinking skills and conceptual understanding in students. Moreover, the research suggested and encouraged that exploring the new methodologies for positive

influence on teaching and learning methodologies.

Recommendations

This Research project which successfully completed has very positive impact in which created and provided new teaching methods to students which help the students to be creative with critical thinking and analyzing skills and further understanding of the physics concepts and the same idea, method and research result will share with other teachers hope they will own the concept attainment model in their classes and area of teaching subject of grade level.

Some recommendation for the new learner and teachers are as below:

1. Special trainings should be conducted on the Concept attainment model.
2. Seminars and workshops should be conduct on the importance and effectiveness of the concept attainment model (CAM).
3. Concept attainment model should be the part of teaching strategies in teacher trainings.
4. Concept attainment model should apply in all subject and area of study.

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