

EFFECTIVENESS OF ICT INTEGRATED CONSTRUCTIVIST APPROACH ON ATTAINMENT OF CONCEPTS IN MATHEMATICS

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ABSTRACT

In the context of integration of information technology and communication in the Teaching / Learning of Mathematics, the present study examines the effectiveness of ICT integrated constructivist approach on the attainment of concepts in mathematics learning also it aims to ascertain the concept and gender independence of ICT integrated constructivist teaching model. The classroom samples in this study included 120 students of class VIII students. Students were divided into experimental group and control group, each having 60 students with the help of one to one matching based on their previous test marks. The true experimental design was used .To study the effectiveness data was collected with the help of self made exemplar materials using 5E constructivist teaching model integrated with ICT and concept based achievements.Pre-test and post-test were administered to compare the result. The results indicated that: Students of experimental group were significantly performed better than the students of control group .So ICT integrated has significant effect on the construction of concept in mathematics for class VIII student. It was concluded that there is no significant difference of concept 1 & concept 2 in experimental group . So ICT integrated has a significant effect on the construction of concepts in mathematics for class VII student.It was also concluded that there was no significant differences between the Mean gain score of Boys & Girls in experimental group . Hence it is concluded that ICT integrated constructivist approach is gender independence and concept independent.

Keywords: Information Communication Technologies, constructivist approach 5E constructivist teaching model

Background of study

The value of mathematics in daily life cannot be questioned. Mathematics finds its application in the fields of science, technology, economics , business, commerce and computer design and functioning"Students need to construct their own understanding of each mathematical concept, so that the primary role of teaching is not to lecture, explain, or otherwise attempt to 'transfer' mathematical knowledge, but to create situations for students that will foster their making the necessary mental constructions.Information Communication

Technology, or ICT, is changing everything about the modern classroom. Chris Abbott states that "schools as institutions are changing rapidly as technology alters the schooling paradigm" (Abbott, 2000, p.48). Incorporating ICTs into the curriculum to enhance learning is also a standard of the 2008 Smart classroom Professional Development Framework.

ICT is so much more than something we have to teach. It is a way of teaching. Technology is such an integral part of

society and needs to be an essential part of education. ICT is a way of preparing our children for the future, engaging them in a constructivist learning environment and giving them authentic learning experiences. Unfortunately, ICT is not always implemented in classrooms today. we will eventually be the new generation of teachers entering the workforce. It is imperative that we not only address our concerns with the lack of resources or implementation of ICTs in everyday classrooms, but more importantly we need to demonstrate our ability to utilize ICTs and offer support and encouragement for less confident teachers. Constant reflection of our teaching methods is critical as we will become life-long learners as the technological age advances. Collaboration with other teachers and students is vital to constantly update our knowledge. This will ensure effective learning outcomes rives this shift from teaching about ICTs to teaching with ICTs.

Constructivists believe that for real learning to occur, knowledge must be constructed; that learners will draw from their own experiences and prior knowledge and apply that to what they have just learnt. From there they negotiate their own meaning, which is relevant to their life. Atkinson and Shiffrin (1968) state that for new information to be transferred into the long term memory, it must correlate with what we already know and what information is already in our LTM. Collaboration and talking with others also plays a big part in learning.

Whether it be through the use of an interactive blog or a project like a video presentation, children are given the opportunity to explore their ideas with and through technology. By allowing students to direct their learning rather than give

direct instructions and set knowledge to learn, they are given the autonomy to discover things for themselves and create a real learning experience. They learn valuable collaboration and inter-personal skills. They learn 'how to learn' with technology by using unfamiliar equipment or programs. They will experience higher-order learning and complex problem-solving skills. ICTs help create ideal learning outcomes. Providing the opportunity for those outcomes to take place through ICT is fulfilling the requirements of the Smart Classroom PDF (2008).

Hopefully going forward with what we now know we can put into practise the new generation ideals of learning in a constructivist setting. (Rogers, 2004) however there are many roadblocks that teachers may encounter. He believes that half the challenge for teachers is to decide when the use of ICTs will best enhance learning. He terms this the "relative advantage" (Rogers, 2004). He believes that as a teacher own must out way the cost and effort of the practise with the benefits.

The rationale of the study

Constructivist learning theory is considered pivotal, and of the intriguing reform efforts in science education during the last decades (Yager, 1996). The pedagogical implications of constructivism are that teachers should act as facilitators who provide appropriate activities and support for students to personally construct meanings, rather than receive them ready-made, from the teacher (Von Glasersfeld, 1995). Teachers need to recognise that students' actions, ideas and errors indicate their current state of understanding and from the students' perspective these are sensible and logical (Wood, 1995).

Further , teachers need to design learning activities that engender "Periods of conflict , confusion , surprise , over long periods, during social interaction " (Wood , 1995 , p. 337) . The related classroom environment should encourage creativity ,problem solving, exploration and sharing of ideas . In the context of a mathematics teachers education classroom this would also include a focus on construction of knowledge of how children learn mathematics and how to design appropriate teaching / learning activities and environment to support this learning .

Many countries are engaged in a number of efforts to effect changes in the teaching / learning process to prepare students for an information and technology based society . The UNESCO World Education Report (1998) notes that the new technologies challenge traditional conceptions of both teaching and learning and , by configuring how teachers and learners gain access to knowledge , have the potential to transform teaching and learning processes . ICTs provide ea array of powerful tools that may help in transforming the present isolated , teacher - centred and text - bound classroom into rich , student - focused , interactive knowledge environments . To meet these challenges , schools must embrace the new technologies and appropriate the new ICT tools for learning . They must also move towards the goal of transforming the traditional paradigm of learning . To accomplish this goal require both a change in the traditional view of the learning processes and an understanding of how the new digital technologies can create new learning environments in which students are engaged .Learners , able to take greater responsibility for their own learning and

constructing their own knowledge . Thomas Kuhn suggests that revolutions in science come about when the old theories and methods will not solve new problems . He calls these changes in theory and methods a " Paradigm Shift " . There is widespread concern that the educational experiences in many schools will not prepare students well for the future . Many educators and business and government leaders believe that creating a paradigm shift in view of the learning process , coupled with applications of the new information technologies , may play an important role in bringing educational system into alignment with the knowledge - based , information - rich society (UNESCO , 2002 , P.15) .

In classroom today , the role of the teachers needs to change from the traditional role of prescript or to that of orchestrator of learning - which necessitates the designing of ICT integrated classrooms promoting higher order cognitive skills . The focus ought to be more on enquiry - based approaches often going beyond the prescribed curriculum delve and seek answers to the problem under concern but now from different perspectives . This methodology is challenging both for the teacher as well as for the learner but eventually the process of self - learning ensures a more rigorous approach and deeper understanding of facts . The focus is more on the process of information acquisition , the critical and analytical thinking in acquiring information from multiple sources , analyzing this information and then designing the learning outcomes in aesthetic presentations . Such a model of learning focuses more on the process over the product acquiring information from

multiple sources , analytical and critical thinking and finally a comprehensive evaluation assessing different areas of student academic growth . Thus this new paradigm shift in learning from constructivist and technological perspective provoked researcher to study the effectiveness ICT integrated constructivist approaches on Attainment of concepts of Class VIII students in Mathematics .

Statement of the problem

The problem of the study is stated as "Effectiveness Of ICT Integrated Constructivist Approach On Attainment of Concepts in Mathematics".

Operational definition of the key term used :

Constructivist Approach

: Constructivism claims that learners construct knowledge most naturally and completely while they are constructing some artifacts. knowledge acquisition is a process of design that is facilitated when learners are actively engaged in designing knowledge rather than merely interpreting or encoding it i.e. Learners benefit the most from the learning process when they are the designers of the instructional experiences. In this study 5E model were used as constructivist teaching approach. Which include following steps.

Engagement Object, event or question used to engage students. Connections facilitated between what students know and can do. **Exploration:** concept or phenomena are explored by integrating ICT, with guidance. **Explanation:** Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought. **Elaboration**

Activities allow students to apply concepts in contexts, and build on or extend understanding and skill. **Evaluation** Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

ICT: In this study information communication technology (ICT) refers to computer-based computer-related and web tool devices. However it also includes a variety of other devices or software that can be used for information and communication purposes.

Objectives of the study

In the view of the importance of the study as stated above , the following objectives were formulated .

- To study effectiveness of ICT integrated constructivist approach on attainment of concepts in Mathematics for class VIII students.
- To study the effectiveness of ICT integrated constructivist approach in relation to different concepts for class VIII students.
- To study the effectiveness of ICT integrated constructivist approach in relation to gender for class VIII students.

Hypotheses of the Study

- i) There is significant effect of ICT integrated constructivist approach on attainment of concepts in Mathematics for class VIII students.
- ii) There is no significant difference between the mean gain score of concepts taught through ICT integrated constructivist approach.

- iii) There is no significant difference between the mean score of boys and girls taught through ICT integrated constructivist approach.

Delimitations of the Study

- i) The study is confined to only CBSE affiliated school of the state of Jharkhand.
- ii) The study is confined to only school of East singhbhum district
- iii) The study is confined to Class VIII only.
- iv) The study is confined to particular subject i.e. Mathematics

Methodology

Design of the Study

The study was an experimental research. True experimental design was used to study the effect of ICT integrated constructivist approach i.e. pre-test post-test equivalent group design

Assignment of groups	Matching of one to one subject	Pre-test	Treatment	Post-test
Experimental Group	Achievement score	Concept based Achievement test	Teaching through ICT integrated constructivist approach	Concept based Achievement test
Control Group	Achievement score	Concept based Achievement test	Teaching through traditional method	Concept based Achievement test

Sample

The sample of the study consisted of 120 student of class VIII. 120 students of class VIII were divided into 60 students for experimental group and 60 students for control group based on one to one matching.

Variables

Independent variable: Teaching through ICT integrated constructivist approach.

Dependent variable: Attainment in concepts

Tools and Techniques

Exemplar materials: In this study exemplar materials were developed by researcher by integrating ICT with 5E constructivist model of teaching. the lesson was integrated with video and PPT.

Concept based Achievement test : This test were developed by researcher to assess the process of construction of concepts taught during experimental period. In order to achieve the desire objective following tools were used :

Experimental Procedure

- To avoid the inter group variability in achievement the scores in Mathematics obtained in the last terminal examination were considered as the criteria for grouping of students.
- The experimental and control groups were made equivalent on the basis of matching group procedure. Only paired subjects were considered for the experiment.
- By selecting four concepts of Mathematics pretest were administered on both groups of class VIII.
- Exemplar materials were developed for each of concepts

based on ICT integrated constructivist approach

- Experimental groups were taught through ICT integrated constructivist approach and control groups were taught through traditional method.
- An concept based achievement test were administered on the concepts taught during the experimental period for both groups.

❏ **Analysis and Interpretation of Data**

After collection of data with the help of relevant tools and techniques, the next logical step, is to analyze and interpret data with a view to arriving at empirical solution to the problem. The data analysis for the present research was done quantitatively with the help of both descriptive statistics and inferential statistics. The descriptive statistical techniques like mean, standard deviation and for the inferential statistics Analysis.

❏ **Major Finding**

- The first hypothesis of the study was There is significant effect of ICT integrated constructivist approach on attainment of concepts in Mathematics for class VIII students calculated t-value is 4.1 is greater than tabular value at both level . It indicates that the Mean Achievement gain score of experimental group is significantly better than control group . Here null hypothesis rejected. Thus there is significant differences between the Mean gain score of experimental group and

control group. It is concluded that students of experimental group are significantly better than the students of control group . So ICT integrated has significant effect on the construction of concept in mathematics for class VII student .

- The second hypothesis of the study was There is no significant difference between the mean score of concepts taught through ICT integrated constructivist approach The calculated value 1.6 is less than the tabular value at both level(.05 and .01) . It indicates that the Mean gain score of concept 1 & concept 2 in experimental group does not differs significantly . So null hypothesis is accepted . Thus there is no significant differences between the Mean gain score of concept 1 & concept 2 in experimental group . Hence it is concluded that there is no significant difference of concept 1 & concept 2 in experimental group .So ICT integrated constructivist approach in concept independent.
- The third hypothesis of the study was There is no significant difference between the mean score of boys and girls taught through ICT integrated constructivist approach. The calculated t-value 1.1 is less than the tabular value at both level (.05 and .01). It indicates that the

Mean gain score of Boys & Girls in experimental group does not differ significantly. So null hypothesis is accepted. Thus there is no significant difference between the Mean gain score of Boys & Girls in experimental group. So ICT integrated constructivist approach is gender independent.

Suggestion for Further Research

Some Suggestion for Further study are :

- ❑ The present investigation was delimited 120 student for class VIII only. For better future studies, it can be extended by increasing the size of sample.
- ❑ The present study was based on two group pre-test and post-test equivalent group design. For future study other experimental design may be used.
- ❑ The present investigation was limited to private school only. This study can undertake for government school also.
- ❑ The present study may be taken in other subject like social studies and language too.
- ❑ In the present study effect of ICT integrated constructivist approach was assessed in relation gender and concept. Future study may undertaken to assess the effect of ICT integrated constructivist approach material in relation socio-economic status of child.
- ❑ In the present study to analysis the data only some specific descriptive and inferential statistical have been use. In future studies more

statistical technique may also imply for better result.

- ❑ Future study can be under taken to assess the effectiveness of ICT integrated constructivist approach in relation to different classes to ensure its class independent.

Discussion

The first finding of the study is similar to the study conducted by, **Major Emily Thenjiwe (2012)**, **Brown-Lopez, Priscilla, Alva, Marie (2010)**, **Ogundola I. Peter^{1*}, A. Popoola Abiodun¹ and O. Oke Jonathan² (2010)**, **Gower St, London WC1E 6BT (2009)**, **Baker, E.; McGaw, B. & Peterson P (Eds) (2007)**, **Aggabao (2005)** conducted study on Radical And Social Constructivism And The Performance Of Students In Mathematics. The second major finding of study was there is significant effect of ICT Integrated constructivist approach on achievement of class VIII students in mathematics in relation to gender. This finding of the study is similar to the study conducted by **Major Emily Thenjiwe (2012)**, **K. Surinder, S. Aruna (2011)**, **G.C. Harish (2011)**, **Ogundola I. Peter^{1*}, A. Popoola Abiodun¹ and O. Oke Jonathan² (2010)**, **Ambrose Hans g. Aggabao¹ (2005)**, **Kaur Surinder, Sharma Aruna (2011)**.

Conclusion

The Constructivist Approach to Mathematics Teaching used to Enhance Student Understanding. Many different methods of teaching are used by mathematics educators around the world. One of these methods is constructivism. Constructivism is by no means an innovative teaching method since it dates back to the time of Socrates. NCF (2000) viewed the child as a discoverer or scientist wherein he takes up the role of scientist

and develops skills and attitudes and construct his own knowledge. Hence it is desirable that the School Education should promote the students to be the constructors and discoverers of knowledge and the teachers as facilitators, guides and mentors NCF (2005). Teacher is required to be a facilitator of children's learning in a manner that the child is helped to construct her knowledge. The Constructivist Learning Environment provides the opportunities for the teachers to transform into facilitators. ICT provides a variety of learning experiences required for the constructivist classrooms. If school teachers are expected to bring about a revolution in their approach to teaching in the school, the same revolution must precede and find a place in the Colleges of Education. There is a need to equip teachers with competencies to use ICT for their own professional development (NCF, 2009). Technology alone never invokes learning. It needs to be embedded with constructivist learning theory for the meaningful learning with varieties of learning tools. So in the present study the importance of successful implementation of constructivist approach using ICT as tools for the teaching of mathematics is emphasized.

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