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**RESEARCH PAPER**

## Effect of Explicit Teaching Modeling on Academic Achievement of Primary Level Students in Mathematics: An Experimental Study

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**ABSTRACT**

This study intended to examine the effects of Explicit Teaching Modelling in the teaching of Mathematics at primary level students in District Gujrat Pakistan along with an effort to find out the achievements in Math on the scale of Bloom's Taxonomy (i.e. Remembering, Understanding & Applying). The purpose of this work was to measure and compare the effect of Explicit Teaching Modeling on achievements of Mathematics at primary level students and to discover the score through achievement tests. The study was experimental in nature and design was Pre test, Post test Control Group. The population of the study was primary level school children in Govt. Girls High School Kunjah and the sample of research was comprised of 60 students of 5th class. The two groups Experimental and Control stood correlated based on annual results of Mathematics of their 4th grade. Experimental Group was taught by Explicit Teaching Modeling and Control Group with the Lecture Method. The scores obtained from Pre-test and Post test groups were the data of the study. Statistical analysis was done by applying the independent t- test. The results proved that Explicit Teaching Modeling was more effective when contrast with the Lecture Method in the Mathematics at primary level. It was recommended that application of Explicit Teaching Modeling has a considerable value for the Mathematics learners.

**Keywords:** Academic Achievement, Explicit Teaching Modeling

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**Introduction**

Every education system is based on teaching which builds mind of future builders. Teaching plays a dynamic role to encourage students for learning. Matthews (2014) stated that if our teaching strategy is wrong or not in a specific or systematic order the knowledge we want that our student gain becomes useless and students may achieve the knowledge but can't apply it in routine life and how we can judge that our student are eligible to bring a positive change in society. Scheffler (2014) identified that learning can be seen as the outcome of teaching that is measurable and is visible through the change in social behavior in the long run, but starts with the change in student in the first instance. Teaching process initiates critical thinking behavior and in turn sharpens the creative mind of the student. Tayyaba (2010) asked many talented students about the Mathematics and they answered, its difficult subject also many of them met complications to learn it. As a lot of reasons to find mathematics tough most of them described about inappropriate teaching method.

Role of Mathematics in students learning curve is very important as it provide knowledge about the facts of life and helps them understand and later on apply in practical lives of students, at every level. For societies, it provides the basics for modern developed society, providing living standards to its citizens (Gravemeijer, Stephan, Julie, Lin, &Ohtani, 2017).

But, Mathematics remains the subject that bothers and poses challenges to majority of students during educational phase. It challenges student's abilities of thinking and

understanding. It demands focus and understanding besides retention and comprehension and requires theoretical knowledge, technical knowledge and a link between present knowledge and prior knowledge (Batanero, Burrill, & Reading 2011). This demands a degree of aptitude from the students whereas more depends upon the learning environment and the method of teaching that a teacher controls. Khan (2012) stated that if we want productive coaching of Mathematics we need effective teachers beyond conventional knowledge. In case of Pakistan, Mathematics as a subject is attracting a few students despite role in daily lives of the student as well as national life as a whole. In the developing and traditional school management system and teaching strategies, students seldom find this subject interesting, in general (Hennessy, Harrison, & Wamakote, 2010). Research has indicated that every year Pakistan Education System conduct exams and its report shows 58% in 2010 and 51% student can pass the exam of Mathematics in 2015 (Jessani, 2019) that is lowest in the region. Major teaching focus remained on memorizing than understanding and application. Change is inevitable and establishing an atmosphere of learning within today's classrooms requires educators and pupils to mutually hold in coaching and studying (Rohrer & Pashler, 2010).

In most of the developing and developed countries, traditional teaching methods have been considered as abolished and Explicit Teaching Modeling' have been pointed as an efficient technique to literacy pedagogy that straightly influences literacy learning (Luke, 2018). Traditional teaching strategy as against explicit teaching model refers to teacher centered focused and behavioral instruction method with cognitive goals and outcomes (Luke, 2014). It is a strategy that is being used to enhance learning skills of students as against traditional methods of cramming and is able to initiate concept/skill as against followership of themes. It enables students to link prior knowledge to existing concept (Luke, 2018). This method is considered as flexible and applicable at all levels without any consideration as to age, class and group setting (Goeke, 2008).

Khan (2012) stated that in case of developing countries, there is a little focus on critical thinking and application sciences subjects including Mathematics. Whereas the purpose of teaching Mathematics as a subject is to prepare citizens which are fully equipped to dissolve issues related to routine work calculations in other words, they will be Mathematical competent.

Many teaching strategies have been used to deliver knowledge, understanding and application of Mathematical concepts. In Pakistan most of the teachers use lecture method to transfer knowledge more willingly than conceptual support, wherein a single teacher delivers knowledge from text book through the lecture method. Generally in Pakistan Math teachers are just source of knowledge rather than to develop concepts. Due to these flaws our students are not able to solve routine life problems. Zakaria, & Iksan, (2007) concluded in their research that variations are required for teaching in Science and Mathematics, so it is the need of time to work on teaching techniques to make math learning better. Doabler, & Fien (2013) stated that the practice of explicit math instruction will likely support the efforts to improve math classroom.

Doabler et al., (2012) in contrast explains Explicit Teaching Modeling is a strategy which not only provides knowledge but also gives students a base to lead applying level. Some researchers advocate that for the most part, explicit modeling provides a suitable system for sustaining high-quality interactions of instruction between students and teachers particularly in Math. As primary level provides base for further studies so it is dire need to deal primary level students with a different approach so that their knowledge becomes applicable for practical life. Therefore, considering the importance of Mathematics at primary level Explicit Teaching Modeling may give a progressive effect on learning of students through which they may apply Mathematical concept\skill in problem solving practically.

## Literature Review

Usually people consider Mathematics as a dry subject. Such an impact developed by teachers because the teaching methods are so poor which could not play an active role in teaching of Mathematics. Primary level is a basic stage for developing concept and procedural knowledge in students which is the basic pillar of higher studies. Rosenshine (1986) states this explicit type of instructional strategy as “a logical way of teaching with focus on proceeding in small, inspection for student learning, and attaining active and outstanding involvement by all students”.

The study on effectual teaching was conducted since 1974 has provided a model of instruction that is practically good for teaching any skills. This model is a logical method for describing material in short pieces of instructions, delaying to check for student learning, and extracting an energetic and flourishing contribution from all students. As this technique was derived mainly from comprehension and Mathematics research carry out in different school levels the result is applicable to any “well structured” (Pressley & Afflerbach, 2012). Educationists have acknowledged a variety of instructional behaviors and aspects of an explicit approach to teaching (Archer & Hughes, 2010). Explicit modeling measures comparable goals with other techniques to teaching. These objectives involve teaching students to be happy and proficient at writing, reading and Math; to accept how Math works and what they read; and to affix concepts in significant Ways (Goeke, 2008).

In Pakistan mostly pupils consider Math as so boring subject. Also Math is an essential subject of the syllabus in about all over the world. In researcher country, Math is regarded as a main part of many domains. Khan (2012) identified that commonly Mathematics is not an interesting subject, and students encounter several difficulties for this, with many selecting out as they are permitted. Ali (2011) stated that in Pakistan, it is poorly educated. Mehmood (2014) describes Mathematics as a very important subject for development of individual student and also for development of society; but in case of Pakistan the students’ performance is not good. Solitary reason of poor approaches of students in Math is old teaching techniques. Particularly from the rural area’s schools, the students pointed out the difficulties in their Mathematics learning experiences because of inexperienced staff and insufficient resources (Memon, 2007; Anderson et al., 2005). Teachers should be supported and given the time and resources to develop better ways for the future (Akhter & Akhter, 2018).

Researchers had identified a number of grey areas, drawbacks, in their analysis; lack of professional teachers is one of them. They also recommend that poor teaching is one of the most prominent issues, so there is a need of engaging different teams of experts in performing the improvement in teaching methods through introduction and implementation of different trainings. In addition to this, there is also a need of adopting modern techniques (Rehman & Khan, 2012).

Ried (2009) underline that work done by Piaget (1963) has defined those young learners tries making sense of whatever gets experienced. Within Mathematics, attempting to master the symbolism and processes can cause more pressure over limited capacity of working memory. The learner may not be enough able of coping up with the ideas (interpretations), applications, symbolisms and processes all at one time.

Ausubel (1968) describes Meaningful learning where what actually gets interpreted is more internalized. It is taken as critical however, the definition of memory make the internalization also interpretation more complicated. Student learning is considered as the major target of process of teaching learning. Practitioners and theorists have been making more efforts to support learning of students through increasing the quality of experiences of learning. Emergence of different learning theories shows educators’ concern to define the conditions, factors and processes involved within the human learning. Application of

different theories of learning have been modifying and altering different methods of learning and teaching (Mahmood, 2004)

The Education Alliance (2006) observed different researches and underlined the list of strategies of instruction that can be identified as best practices within the education of Mathematics:

1. Target lessons on particular skills/concepts that are standards-dependent.
2. Doing the differentiation of instruction through varying different question levels, utilizing tiered assignments, compacting, individualization of lessons and flexible grouping.
3. Ensuring that instructional practices are learner-focused and stress mainly over the problem solving.
4. Using prior knowledge and experience as the major base for developing new knowledge
5. Using the strategies of cooperative learning and making association.
6. Using scaffolding for making association to understanding, processes and concepts.
7. Asking probing questions that needs the justification of responses of students.
8. Stressing the basic computational skills' development

### **Lecture Method**

Lecture Method is defined as an instructional strategy where the instructor controls the group of students, verbally elaborate the lecture although students pay attention and listen in inactively. In last students ask a question (Eggen&Kauchak, 2001). Lengthy classroom actions are lay stress on higher classes (Warawudhi, 2012). Learner' participation in this way of instruction is mostly to listen, write down a few notes throughout the lecture, join the writing material and arrange it (Marmah, 2014). Lectures, however repeatedly condemned for their consistent way of teaching and which are connected with less interesting on the face of the learners interest to a less learning achievement, they are at a halt of the well-organized educational technique acknowledged in higher education (Abdulbaki, et.al., 2018).

Lecture Method is very elastic to schedule, content, various listeners, and they play a priceless part in the common lifestyle of the students (Carpenter, 2006).

### **Explicit Teaching Modeling**

The major objective of Explicit Teaching Modeling is to give students a various respective and clear standard of concept. The educator is considered as a best one who is better prepared for delivering the given model. Explicit modeling is basically a teacher attentive method of institution which is considered more efficient for teaching isolated or basic assistances (Oliva et al., 2007). Explicit instruction gives reasonable challenge and a choice of taking an extra step in the proximal development zones to students (Lewis et al., 2015). In the given research, explicit instruction deals with the information that owns an intellectual mark with student and teacher communication and control of teacher (Hamre et al., 2013). This kind of instruction is seen dependent over the teacher to think, model and explain clearly related to the educational target of the given lecture. Along with it, explicit strategy is seen dependent over students' time for practicing some new strategy or skill with teacher feedback and guidance. At the end, explicit instruction makes the students enough able to become like some independent learners.

Explicit instruction has around eight important points:

1. Skill/concept is divided into important elements/features.
2. Teacher defines the skill/concept clearly.
3. Teacher does the modeling of skill/concept in a clear way.

4. Multi-sensory instruction (kinesthetic, tactile, auditory, visual)
5. Teacher thinks more as he/she models.
6. Teacher does the modeling of non-examples and examples.
7. Cueing
8. High levels of interaction of teacher with student

Swanson underlined 12 criteria linked with the explicit modeling. Explicit instruction occurs in case when any of the four indicators of the models are seen present.

1. Division of task into smaller steps
2. Administration probes
3. Administration of feedback in a repeated manner
4. Giving a diagram or pictorial representation
5. Permitting individually and independent practice and instruction
6. Dividing the instruction into simple stages Instruction in a small group involves given steps:
7. Giving instructions in a smaller group involve given steps
8. Teacher doing the modeling of some skill
9. Giving set materials at faster rate
10. Giving child instruction individually
11. Teacher asking different questions
12. Teacher showing the new materials (Swanson, 2001).

### **Research Hypothesis**

H01: There is no difference in mean achievement of Control Group and Experimental Group

### **Material and Methods**

The present work commenced to relate the effects of Explicit Teaching Modeling against the Lecture Method and to discover the achievements of primary level learners in Mathematics. It is an experimental research which is strictly holds to a scientific research design. The present work based upon "Pre-test Post test Control Group Design" which is known as classic controlled group experimental design. Both groups firstly got Pre-test than after delivering lectures to both groups Post tests were taken. This research study having population of 5<sup>th</sup> grade students of the Government schools in the district Gujrat. Out of this population random sampling was drawn. Tehsil Gujrat and one school were selected randomly for further proceeding. In this school 120 students were in 5<sup>th</sup> standard out of which 60 students as a sample were nominated randomly for this research. The 60 students were nominated randomly which made a sample 30 students in each group for the present work. Both groups (Experimental and Control) stayed and equated based on of 4<sup>th</sup> class Annual result's marks in Mathematics. Tool of research study was achievement tests that were based on three cognition levels' (Remembering, Understanding and Applying) of Bloom's Taxonomy. Tests were developed by keeping in view the cognition levels (Remembering, Understanding, and Applying) of Bloom's Taxonomy, with support of minimum standards R, U and A level in 5<sup>th</sup> standard provided in syllabus and each level test was provided one step lower difficulty level to ensure knowledge as per completed years of education. The items of each test were related to R, U and A. Each test was later on validated through discussion and expert opinion from concerned teachers, part by part. This research study was accomplished on teaching of Mathematics for 5 weeks in 5<sup>th</sup> class at Govt. Girls High School Kunjah. The Experimental Group was given treatment (Explicit Teaching Modeling through lesson plans) for five days in a week i.e. Monday to Saturday for fifty minutes per day. Friday is missing due to timetable settings of school administration. Meanwhile the Control Group was educated by a new one science educator. Pre and Post tests were same but Pre-test taken before teaching and Post test after it. In this research

activity, scientific research methodology with experimentation was applied. In order to test the hypotheses, it was imperative to test the input against the output therefore lesson plans were used as inputs to test the veracity of Explicit teaching method with the selected sample of school children. After the completion of teaching period, tests were conducted to see results as to improvement or no improvement, hence to check the hypothesis.

## Results and Discussion

**Table 1**  
**Achievement of Control and Experimental Group in Overall Pre-Test**

Tests	Groups	N	Mean	Std. Deviation	T-value	df	P value
Overall Pre-Test	Control Group	30	6.93	2.288	0.107	58	0.915
	Experimental Group	30	7.00	2.519			

Table -1 shows that mean for experimental group (M= 7.00, SD= 2.519) is nearly equal to mean of control group (M=6.93, SD = 2.288) and  $t(58) = 0.107$ ,  $P > .05$  indicated that no significant difference is observed between mean of experimental group and control group in the overall Pre-test of students' achievement. Result is concluded that both groups are equal in achievement level.

**Table 2**  
**Achievement of Control and Experimental Group in Overall Post-Test**

Tests	Groups	N	Mean	Std. Deviation	T value	df	P-value
Over all post test	Control Group	30	88.47	27.31	5.505	58	0.000
	Experimental Group	30	124.23	22.78			

Table-2 shows that mean for experimental group (M= 124.23, SD= 22.78) is greater than mean of control group (M=88.47, SD = 27.31) and  $t(58) = 5.505$ ,  $P < 0.05$  indicated that significant difference is observed between mean of experimental group and control group in the overall Post test of students' achievement. Result is concluded that the use of explicit teaching modeling for delivering lessons has significant effect on achievement.

**Table 3**  
**Comparison of Control and Experimental Group in Post test at Remembering Level**

Tests	Groups	N	Mean	Std. Deviation	t-value	df	P value
Post test result at Remembering Level	Control Group	30	40.00	6.71	3.24	58	.002
	Experimental Group	30	45.27	5.84			

Table-3 shows that mean for experimental group (M= 45.27, SD= 22.78) is greater larger than mean of control group (M=88.47, SD = 27.31) and  $t_{(58)} = 3.24$ ,  $P < .05$  indicated that significant difference is observed between mean of experimental group and control group in the overall Post test of students' achievement at remembering level. Result is concluded that the use of explicit teaching modeling for delivering lessons has significant effect on achievement

**Table 4**  
**Comparison of Control and Experimental Group in Post test at Understanding Level**

Tests	Groups	N	Mean	Std. Deviation	T value	df	P value
	Control Group	30	37.03	12.21	3.90	58	.000

Post test result at Understanding Level	Experimental Group	30	47.60	8.41
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Table 4 shows that mean for experimental group ( $M= 47.60$ ,  $SD= 8.41$ ) is greater than mean of control group ( $M=37.03$ ,  $SD= 12.21$ ) and  $t_{(58)} = 3.90$ ,  $P<.05$  indicated that significant difference is observed between mean of experimental group and control group in the overall Post test of students' achievement at understanding level. Result is concluded that the use of explicit teaching modeling for delivering lessons has significant effect on achievement

**Table 5**  
**Comparison of Control and Experimental Group in Post test at Applying Level**

Tests	Groups	N	Mean	Std. Deviation	T value	df	P value
Post test result at Applying Level	Control Group	30	11.43	10.50	6.93	58	.000
	Experimental Group	30	31.37	11.74			

Table-5 shows that mean for experimental group ( $M= 31.37$ ,  $SD= 11.74$ ) is greater than mean of control group ( $M=11.43$ ,  $SD = 10.50$ ) and  $t_{(58)} = 6.93$ ,  $P<.05$  indicated that significant difference is observed between mean of experimental group and control group in the overall Post test of students' achievement at applying level. Result is concluded that the use of explicit teaching modeling for delivering lessons has significant effect on achievement

Based on the findings of this work it could be stated that there is a substantial difference between Explicit Teaching Modeling and Lecture Method in all three cognition level i.e. Remembering, Understanding and Applying. In case of pre-test the results of both groups i.e. control and experimental were very close at overall level. The three levels of cognitive domain i.e., Remembering, understanding and applying results of post test remained different and showed that Explicit Teaching Modeling strategy is better than the Lecture Method.

Mathematics teaching around the world has been changed with the passage of time however the Lecture Method is still applicable in most of the under developed countries. Lecture Method is considered as restricted to cramming without understanding the art to apply the imparted knowledge (Doabler et al., 2012; Amer, 2006).

This investigation also finds that students of EG got significant results as compared to CG in all three levels and overall post test Modern day Mathematical teaching has evolved with new teaching methods depending upon the needs of the students and some are more applicable than other. In this research, Explicit Teaching Modeling has been tested against Lecture Method. The results indicate that Explicit Teaching Modeling technique is more suitable than Lecture Method and may be replicated in the Govt. Sector educational institutes.

## Recommendations

In view of this research activity, subsequent recommendations are forwarded for consideration:

1. As Explicit Teaching Modeling revealed its strength on Lecture technique so it can be proposed that teachers should use this for teaching of Mathematics in all schools at district Gujrat.
2. At the level of government schools, science studies especially Mathematics should be taught by using Explicit Teaching Modeling.

3. The Explicit Teaching Modeling may be adopted on experimental basis in selected schools in each district for three years and may be replicated in rest of the schools in public sector after exhaustive analysis of each case.



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