



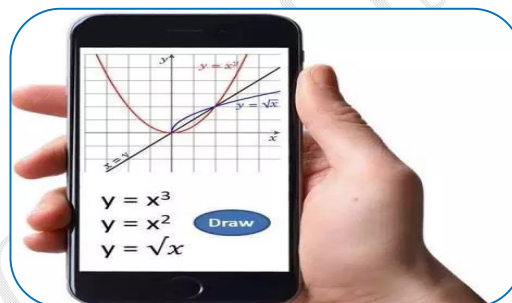
## A STUDY OF TEACHING EFFICACY OF MATHEMATICS TEACHERS IN RELATION TO THEIR ATTITUDE TOWARDS MOBILE LEARNING

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### ABSTRACT :

Mathematics is one of the most crucial and key subject among other school subjects usually taught at school level. Due to this reason the role of mathematics teacher also becomes very serious as their knowledge about the subject matter along with the pedagogy is expected to be of remarkable level. There is another fact that a mathematics teacher has direct impact on the achievement level of his/her students which is leading to the modern researchers to concentrate upon this aspect of mathematics education. With the increase of technological interference in the field of education in general and mathematics education in particular, the role of mobile phones and its associated technologies is also increasing day by day. The modern mathematics teachers are expected to have a good knowledge about these kind of technologies along with their knowledge of the subject matter and pedagogical skills. The present study has explored the attitude of **Sixty (60)** mathematics teachers towards the Mobile Learning and its relationship with their teaching efficacy at secondary level.



**KEYWORDS :** Teaching Efficacy, Attitude and Mobile Learning.

### INTRODUCTION

It is a well-established fact that the process of education is the only mean that can successfully enlighten and empower an individual in order to attain for a better, successful and good quality life. The actualization of potentialities within an individual can be performed successfully with the help of education and further it can result into strengthening of their competencies, talents, interests and inculcation of values. The entire process of education continuously revolves around the curriculum and its teachers, since a resourceful and competent teacher is the only entity in school system which can successfully guide the process of education even in the absence of necessary infrastructure and resources. If the mathematics teachers timely acquire necessary professional competencies including technological skills, it can result into extreme commitment in their functions for performing kinds of task as a teacher. This kind of teachers can perform an extremely effective teaching that can lead to the educational goals at national level and thereby leading to the well-cherished goals of nation-building.

**(a). Teaching Efficacy:** In teaching profession the meaning of teacher's competencies is the well-defined chunk of knowledge, teaching abilities, teaching skills and content knowledge a teacher usually possess and implement in their profession. The teacher's competence differs from his/her performance significantly as it is the characteristics of a teacher that does not change significantly even when the teacher is subjected from

one situation to another. It is a much broader term in the sense that it comprised of a teacher's personality and its teaching learning process and behavioral outcomes of the students. On the other hand, the teaching performance is just restricted to their classroom behavior and interaction during real teaching-learning process. A more competent teacher is likely to have more competencies and he is able to direct his/her students to the right path and enable them to perform in academics efficiently.

On the hand the teaching effectiveness of a teacher can't be ensured automatically by their professional competencies and teaching skills practices alone. However the role of their competencies can't be denied in their teaching competencies as their actual classroom consistent performance is govern by their commitment or willingness to perform well in the classroom. The decisive professional commitment and their role is the determinant of the content of teacher education as well trained teachers are those who are competent and committed/dedicated professionals. Due to this reason the purpose of fostering professional commitment has become an integral aim of teacher education programs now a days. Teachers' efficacy is considered to be associated with their positive teaching behaviors and which in turn is expected to result into successful students' achievements. There are various studies which have proved that in the academic achievement of mathematics students, their teacher plays a very effective role along with other factors associated with the school and the individual students. Therefore any education system can be declared successful only with the presence of effective and competent teachers equipped with necessary knowledge and skills. In other words it can be concluded that teachers' efficacy or their belief in their capabilities to perform efficiently and effectively is one of the significant factor that usually determine the nature of a successful education system.

**(b). Mobile Learning:** New innovations in the form of technology and other advancement is molding the age-old techniques of teaching and learning at a significant pace which is leading to the process of uncovering spheres of learning and students' growth. It is usually believed that with the application of technology in the field of education and teaching-learning it is likely that the learning efficacy of students usually increase and in turn which leads to the reduction in the training cost of teachers. In modern days the use of mobile phones is increasing day by day and they have completely dominated the lives of a common man in general and that of teachers and students in particular. The concept of mobile learning entered in the educational scenario with a positive and sound approach which is basically addressing a number of significant educational problems in the field of mathematics. The continuous up gradation of android technologies and other emerging new technologies/tools have initiated the innovative ways of teaching-learning which has resulted into the increased power and speed at all levels and spheres of education.

In the words of **Akpınar et. al. (2018)**, "One of the advantages of mobile learning is the ability to provide access to learning contents out of the course time and Mobile learning management systems might be used to provide this." In addition to this, the android applications and innovative contents available for mobile learning on android phones through internet are basically developed on sound principles of learning and designed by qualified persons as well. There are so many mathematics applications which have been developed by organizations like **Khan Academy** that can be used for self-learning of teachers and students specifically in the subject of Mathematics. But most of the learning outcomes depends on the level of determination of users and number of visits made by them on the sites. In the words of **Sayin, Z. (2010)**, as reported by **Akpınar, E. et. al. (2018)**: "Determining and reporting duration and number of the visiting sessions in the mobile learning system are important." But there are some technical regulations that are being proposed for making learning provided through Mobile Phones effective e.g. screen size, sound infrastructure for its use and native languages based Mobile applications as it is likely to help individual students in a specific manner. In spite of the so many benefits associated with the Mobile learning there are some restrictions also which hinders learning. But there are various studies that have proved that the learning through mobile phones is much more permanent than other modes of learning. On the same pattern **Evans (2008)** remarked as reported by **Akpınar, E. et. al. (2018)**, "Mobile learning is more effective and beneficial than other resource materials, and more supportive in the process of learning." With the help

of Mobile learning offers one has access to varied kind of information in a quick manner for teachers and students both. There are different ways of learning which are diverse in nature but in spite of those limitations contextual learning can be provided to the students and in addition to this they have complete control on the process of learning and supporting resource material as they are available to them whenever they need.

#### REVIEW OF THE RELATED LITERATURE:

The following studies have been explored during the study by the investigator. A brief description of these studies is being provided in the forthcoming points.

- ❖ **Celik, H.C. &Karayaman, S. (2018)** conducted a study for investigating the attitudes of prospective Mathematics Teachers towards the Use of Mobile learning at a higher learning institution and the study aimed at to explore their attitudes towards mobile learning in relation to their background variables and examine their views regarding this aspect. The study was a mixed method research which was conducted on a sample of 181 perspective mathematics teachers selected through convenient sampling methods. After a careful analysis it was revealed that the prospective mathematics teachers were found having a medium level of attitude towards mobile learning. The attitudes of the male mathematics prospective mathematics teachers was found higher than their female counterparts towards Mobile learning.
- ❖ **Demir, K. &Akpınar, E. (2018)** conducted a study in order to explore the effects of mobile learning applications on academic achievement of students and their attitudes towards mobile learning. The study utilized the Quasi-experimental design of research and the experimental group containing 15 students was taught with the help of a mobile learning-based strategy, while the control group containing 15 students was taught through the traditional lecture method. The two tools i.e. an attitude scale that was used to explore the students' attitudes towards mobile learning and an achievement test that was used to observe the effect of mobile learning on the achievement of the students' achievement. The findings so obtained suggested that mobile learning were found to be helpful in students' academic achievement and the mobile learning was found having a positive impact on academic achievement and level of motivation of students.
- ❖ **Takhneh, B.A. (2018)** explored attitudes of mathematics students towards the use of Mobile applications in the teaching of Mathematics enrolled in Open Learning Systems. The study was conducted on a randomly selected sample of 57 students, who were enrolled in the mathematics course through the department of educational studies at the Arab Open University, Jordan. The results obtained through the study revealed that there was a significant difference between the male and female students' attitude towards the use of Mobile technologies in the field of education. In light of the results obtained from the study, the researcher recommended that mobile applications should be used in teaching of mathematics courses being provided through open learning systems.
- ❖ **Back, Y. et. al. (2017)** explored the teachers' attitudes towards Mobile Learning in North Korea. This study tried to explore the attitudes of Korean teachers towards mobile learning in relation to their gender, school level, teaching experience, and teaching subjects. The results so obtained from the study after a careful statistical analysis revealed that the teachers' attitudes was towards Mobile learning was of lower level and the attitude of female teachers were more favorable than their male counterparts. Further the teachers having an experience of more than 15 years were found having higher level of attitudes towards mobile learning than the teachers having low experience. On the other hand the language teachers were also found having more positive attitude towards Mobile learning than other teachers belonging to different streams of teaching.
- ❖ **Willacy, H. (2017)** explored the ways of providing personalized learning through the use of mobile technologies in the subject of mathematics. The personalized mode of learning is normally considered of extreme benefits for the enhancement of students' level of learning. Due to these characteristics the Mobile technologies are of the sufficient potential enough to promote the habit of personalized learning

among students. This paper tried to explore the evidences of personalized learning that was evidenced as a result of the practices of three in-service teachers. The data obtained through the video recordings of the classroom practices of the above three teachers were used in order to analyze the use and effectiveness of Mobile technologies within the practice of personalized learning.

### SIGNIFICANCE OF THE STUDY:

The competence of an ideal teacher is expected to be realistic and all-round in every aspect as he has to play so many roles in school organization and management. Some of his competencies includes: ability to frame and prepare teaching lessons/modules, planning and execution of instructions according to the requirements of his/her students. For performing all his/her roles, she/he needs continuous professional development and up gradation of knowledge for the sharpening of their skills. There is a constant expectation on the side of their department to be expert in all kind of technological advancement and skills that can be used by them for the effective presentation of the subject matter in the classroom so that their students' academic achievement could be ensured. As Mobile devices are being widely used in the modern educational scenario due to the facilities available on Mobile phones through Internet which makes these devices suitable for using by the teachers and students. In the words of **Ozan, (2013)**, "The use of mobile devices in educational contexts in terms of classroom teaching is helpful for students in developing right attitudes towards their learning. Moreover their interest and motivation for learning are enhanced by mobile learning." Recently, for the teachers of Directorate of Education, Delhi Govt. has provided free tablets for the enhancement of Mobile learning habits and their skills. Besides this, most of the teachers have smartphones with the facility of using Internet and Multimedia. All these efforts can prove successful only in the case, if the teachers are having right and positive attitude towards Mobile learning. So the present study is an effort to explore the efficacy of secondary school mathematics teachers in relation to their attitude towards Mobile Learning.

**Title of the Study:** The study has been titled as: "A Study of Teaching Efficacy of Mathematics Teachers in relation to their attitude towards Mobile Learning."

### OPERATIONAL DEFINITIONS OF THE TERMS AND CONCEPTS:

The terms and concepts used in the study have been defined operationally as under.

- ❖ **Teaching Efficacy:** It is the ability of a teacher to interact between, in order to meet the physical, emotional, intellectual, physiological, social and psychological requirements of the students with the help of their content efficiency for the achievement of desirable goals of learning.
- ❖ **Mobile Learning:** In the context of present study, the concept of Mobile Learning has been used for all kind of learning that can be induced with the help of smartphones through the application of internet resources and all other associated applications that are available for Mathematics learning.

### RESEARCH QUESTIONS:

The present study is an attempt to answer the following questions:

- ❖ What is the current level of Teaching Efficacy of Mathematics Teachers in relation to their certain background variables?
- ❖ What is the current level of Attitude of Mathematics Teachers towards Mobile Learning in relation to their certain background variables?
- ❖ In what manner the Level of Teaching Efficacy of Mathematics Teachers is associated with their attitude towards Mobile Learning?

**OBJECTIVES OF THE STUDY:**

The present study has been conducted in order to fulfill the following objectives:

- ❖ To find out the level of teaching Efficacy of Mathematics Teachers in relation to their certain background variables i.e. Gender, Experience and Post.
- ❖ To find out the level of Attitude of Mathematics Teachers towards Mobile Learning in relation to their background variables i.e. Gender, Experience and Post.
- ❖ To find out the extent of relationship between the Teaching Efficacy of Mathematics Teachers and their attitude towards Mobile Learning in relation to their background variables i.e. Gender, Experience and Post.

**HYPOTHESES OF THE STUDY:**

The following hypotheses have been formulated and tested using the suitable statistical techniques:

- ❖ There is no significant difference between the levels of Teaching Efficacy of Mathematics teachers in relation to their Gender.
- ❖ There is no significant difference between the levels of Teaching Efficacy of Mathematics teachers in relation to their Experience.
- ❖ There is no significant difference between the levels of Teaching Efficacy of Mathematics teachers in relation to their Post.
- ❖ There is no significant difference between the levels of Mathematics Teachers' Attitude in relation to their Gender.
- ❖ There is no significant difference between the levels of Mathematics Teachers' Attitude in relation to their Post.
- ❖ There is no significant difference between the levels of Mathematics Teachers' Attitude in relation to their Experience.
- ❖ There is no significant relationship between the overall Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of TGTs Mathematics.
- ❖ There is no significant relationship between the overall Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of TGTs Mathematics.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of PGTs Mathematics.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers Male.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers Female.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Highly Experienced Mathematics Teachers.
- ❖ There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Low Experienced Mathematics Teachers.

**DESIGN OF THE STUDY:**

The present study is a kind of descriptive which has adopted a correlational design in order to explore the relationship between teaching efficacy of Mathematics Teachers and their attitude towards Mobile Learning.

- ❖ **Population:** All the Mathematics teachers working in the Govt., Govt.-aided and private schools, which comes under the jurisdiction of Directorate of Education, Delhi comprised of the population for the present study.



- ❖ **Sample:**The sample for the present study was selected using the Multi-stage random sampling techniques and comprised as under. Random selection of one educational district @ Random selection of Two Zones from district selected @ Random Selection of **Thirty Schools (Fifteen from each zone) @ Random Selection of 02 Teachers from each School.**In this way final sample comprised of **60 Mathematics Teachers i.e. 30 TGTs and 30 PGTs. (30 Mathematics Teachers Male and 30 Mathematics Teachers Female)**
- ❖ **Tools Used:** The following two tools have been used during the study: **(a).** A standardized Teacher Effectiveness scale by **Kumar and Mutha (1974)** for the assessment of Mathematics Teachers' Efficacy. The scale contains 69 items covering all the essential aspects of good teaching; **(b).** A self-constructed attitude scale, in order to explore the attitude of mathematics teachers towards Mobile learning. The scale contains 40 items and reliability through test-retest method was found to be **0.82** and its validity was assessed through expert opinion and found to be satisfactory.
- ❖ **Statistical Techniques Used:**The statistical techniques like Mean, S.D., T-test and **Karl Pearson's Coefficient of Correlation** have been used for the analysis of data in order to draw the necessary conclusion from the data.
- ❖ **Delimitations of the Study:**The study has been confined to the Mathematics teachers working in the schools of Directorate of Education, Delhi only.

### FINDINGS FROM THE STUDY:

The desirable information obtained after a careful analysis of data can be described as under in the following three sections.

**(a). Description and Differential Analysis of Teaching Efficacy of Mathematics Teachers:**The level of Teaching Efficacy of Mathematics Teachers has been analyzed using the basic descriptive analysis techniques like Mean and Standard Deviation etc. The results so obtained have been described in the forthcoming tables.

**Table 1: Description of the Teaching Efficacy of Mathematics Teachers**

N	Maximum	Minimum	Mean	S.D.
60	301	104	213.65	49.12

The **Table No. 1** shows that the minimum value of efficacy of mathematics teachers is **104** and maximum value is **301**, and the mean level of Teaching Efficacy was found to be **213.65** with a S.D. of **49.12**.

**Table 2: Description of the Level of Teaching Efficacy of Mathematics Teachers**

Level (s)	Very High	High	Moderate	Low	Very Low	Total
No. of Teachers	05	13	22	12	08	60
%age	0.08	21.67	36.67	20.00	13.33	100%

The **Table No. 2** shows that the level of Teaching Efficacy of Mathematics Teachers has been described into five levels. Most of the teachers i.e. approximately 65% teachers have been found to be Moderate level to very high level. Only a very few i.e. approximately one-third of the total teachers were found having low to very low level of teaching efficacy.

**Table 3: Differential Analysis of the Teaching Efficacy of Mathematics Teachers**

Group(s)	Mean	S.D.	N	SE <sub>M</sub>	t-value	Significance
Male	226.67	42.49	30	7.76	2.11	0.03*
Female	200.63	52.46	30	9.58		
TGT	200.57	51.69	30	9.44	2.12	0.03*
PGT	226.73	43.38	30	7.92		
Highly-Exp.	211.50	47.32	24	8.64	0.34	0.74
Low-Exp.	215.80	51.56	36	9.41		

The teaching efficacy of Mathematics teachers was compared in terms of their Gender, Post and Experience. It is evident from the **Table No. 3** that is found to be significant in case of Gender and Post at **0.05 level of significance**, while in the case of Experience it was not found to be significant at any level.

**(b). Description and Differential Analysis of Mathematics Teachers' Attitude towards Mobile Learning:**The level of Mathematics Teachers' attitude towards Mobile Learning has been analyzed using the basic descriptive analysis techniques like Mean and Standard Deviation etc. The results so obtained have been described in the forthcoming tables.

**Table 4: Description of the Attitude of Mathematics Teachers towards Mobile Learning**

N	Maximum	Minimum	Mean	S.D.
60	185	29	122.16	40.51

The **Table No. 4** shows that the minimum value of level of attitude of mathematics teachers towards Mobile Learning is **29** and maximum value is **185**, and the mean level of attitude towards Mobile Learning was found to be **122.16** with a S.D. of **40.51**.

**Table 5: Description of the Level of Attitude of Mathematics Teachers towards Mobile Learning**

Attitude	Extremely Favorable	Favorable	Moderate	Unfavorable	Extremely Unfavorable	Total
No. of Teachers	08	12	23	11	06	60
%age	13.33	20.00	38.33	18.33	10.00	100%

The **Table No.5** shows that the level of Attitude of Mathematics Teachers towards Mobile Learning has been described into five levels. Most of the teachers i.e. approximately 71% teachers have been found to be Moderate level to Extremely Favorable level of attitude towards Mobile Learning. Only a very few i.e. approximately 28% of the total teachers were found having unfavorable attitude towards Mobile Learning.

**Table 6: Differential Analysis of the Attitude of Mathematics Teachers towards Mobile Learning**

Group(s)	Mean	S.D.	N	SE <sub>M</sub>	t-value	Significance
Male	132.93	32.43	30	5.92	2.13	0.03*
Female	111.30	45.22	30	8.26		
TGT	131.07	31.52	30	5.76	1.74	0.08
PGT	113.67	46.69	30	8.52		
Highly-Exp.	118.00	45.46	24	8.30	0.79	0.43
Low-Exp.	126.23	35.18	36	6.42		

The attitude of Mathematics teachers towards Mobile Learning was compared in terms of their Gender, Post and Experience. It is evident from the **Table No. 6** that is found to be significant in case of Gender at **0.05 level of significance**, while in the case of Post and Experience it was not found to be significant at any level.

**(c). Correlational Analysis:** The correlation between teaching efficacy and the attitude of mathematics teachers was analyzed using the Karl Pearson's Coefficient of correlation and further its significance was also tested in terms of the background variables i.e. Gender, Post and Experience.

**Table 7: Showing the Significance of Coefficient of Correlation between Level of Teaching Efficacy and Attitude of Mathematics Teachers towards Mobile Learning**

Serial No.	Variable (s)	N	Coefficient of Correlation	Significance
1.	Teaching Efficacy	60	0.29*	Significant at 0.05 Level
2.	Attitude towards Mobile Learning			

- ❖ The overall correlation between the level of teaching efficacy of Mathematics teachers and their attitude towards Mobile Learning was found to be **0.29** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the overall Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers.**
- ❖ The correlation between the level of teaching efficacy of TGTs Mathematics and their attitude towards Mobile Learning was found to be **0.24** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of TGTs Mathematics.**
- ❖ The correlation between the level of teaching efficacy of PGTs Mathematics and their attitude towards Mobile Learning was found to be **0.32** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of PGTs Mathematics.**



- ❖ The correlation between the level of teaching efficacy of Mathematics Teachers Male and their attitude towards Mobile Learning was found to be **0.30** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers Male.**
- ❖ The correlation between the level of teaching efficacy of Mathematics Teachers Female and their attitude towards Mobile Learning was found to be **0.27** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Mathematics Teachers Female.**
- ❖ The correlation between the level of teaching efficacy of Highly Experienced Mathematics Teachers and their attitude towards Mobile Learning was found to be **0.35** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Highly Experienced Mathematics Teachers.**
- ❖ The correlation between the level of teaching efficacy of low Experienced Mathematics Teachers and their attitude towards Mobile Learning was found to be **0.23** which was found to be significant at **0.05** level of significance. Which led to the rejection of our Null Hypothesis: **There is no significant relationship between the Level of Teaching Efficacy and Level of Attitude towards Mobile Learning of Low Experienced Mathematics Teachers.**

#### CONCLUSION:

On the basis of the results obtained from the study the teaching efficacy of Mathematics teachers was found to be ranging from average to very high. It was also reported that there is a significant difference in terms of their teaching efficacy on the basis of the gender and post but on the basis of their experience no such difference was reported. On the other hand the attitude of Mathematics Teachers towards Mobile Learning was found to be favorable to extremely favorable. But there existed a difference in terms of their gender but no such difference was reported in terms of their experience and post. The study reported a moderate level of significant correlation between the teaching efficacy of mathematics teachers and their attitude towards Mobile Learning which leads to the conclusion that the mathematics teachers with a favorable attitude towards mobile learning are more effective than those who are having unfavorable attitude towards Mobile Learning. Therefore it is recommended by the researcher on the basis of the results of the study that the use of Mobile Learning should be promoted among teachers and students of Mathematics for the promotion of meaningful and effective learning in mathematics. In order to make Mobile learning more popular among teachers and student there is a need of organization of orientation and training programs for teachers and for students also. With the help of such programs they can achieve well desired goals of mathematics education with minimum efforts and in a meaningful manner.

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