



# EFFECTIVENESS OF TEACHING METHODS ON LEARNING OUTCOMES IN MATHEMATICS : AN ANALYSIS OF PERCEPTION OF PROSPECTIVE TEACHERS

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## Abstract

Teaching methods plays a vital role in shaping the learning outcomes and experiences of mathematics education. The effectiveness of teaching methods in the classroom can be greatly influenced by the potential of teachers' attitude and beliefs about these methods. In order to improve teaching practices and to enhance students learning outcomes, it is necessary to understand how perspective teachers perceive teaching methods, their preparedness for the implementation of those methods as well as the obstacles they may face. The present study investigates prospective teachers' attitudes and beliefs towards teaching methods in mathematics education. The sample selected for the study is prospective teachers at secondary level and the tool used to collect data is Questionnaire on Effectiveness of Teaching methods on Learning Outcomes in Mathematics. The findings of this study indicated an optimistic perspective among prospective teachers regarding their confidence in implementing teaching methods, the need for continuous professional growth, flexible instructional approaches, and adequate support systems to facilitate favorable achievement. Additionally the participants demonstrated a readiness to address obstacles and improve their teaching practices through continual learning and adjustment.

## Key words

*Teaching methods and techniques, learning outcomes in Mathematics*

## INTRODUCTION

Mathematical education has a significant role on students' cognitive skills, problem solving abilities, and academic performance. Effective teaching methods are essential for creating learning experiences and helping students to master mathematical concepts. Since prospective teachers are responsible for providing high quality mathematical instruction, it is important to understand their views on teaching methods and their readiness to implement them. Prospective teachers' perception of teaching methods in Mathematics arises from the recognition of the pivotal role that educators play in students' mathematical learning journey. According to Hattie (2009), effectiveness of teaching methods significantly influences students' engagement, understanding and achievement in mathematics. Damodharan and Rengarajan (1999) supports that teaching method is effective in improving students' academic performance. Understanding how prospective teachers feel about teaching methods and how they view them is important for supporting effective teaching methods and improving students' performance. Furthermore, with the increasing emphasis on evidence- based teaching and the integration of technology in education, there is a growing demand for prospective teachers to be well-equipped with diverse instructional strategies and digital tools. According to Arbaugh (2000) and McBrien and Jone (2009) the technology use like videos increases attendance of students, participation and their engagement.

However, despite the availability of various teaching methods and resources, prospective teachers may face challenges in selecting, implementing, and adapting these methods to meet the diverse needs of students in the classroom. Prospective teachers' attitude and beliefs towards the teaching methods can significantly impact their effectiveness in the classroom. Understanding how

prospective teachers perceive teaching methods, their preparedness to implement them, and the barriers they anticipate is essential for improving instructional practices and enhancing students learning outcome.

In the realm of education, the importance of future educators in influencing students' learning experiences and result cannot be underestimated. Before they embark on their teaching careers, it is crucial to grasp their views and feelings about different teaching methods. Their instructional decisions and practices in the classroom can be greatly affected by these perceptions, which can ultimately have an impact on student learning outcomes. Rafiq et al., (2022) concluded that teaching methods promote greater student engagement, retention of knowledge and motivation. Also, these methods foster active participation of students, communication skills, and collaboration which are crucial for success in the 21<sup>st</sup> century. According to constructivism theories based on observations, students develop and construct their own knowledge and understanding (Mills,2004). Constructivist teachers encourage students to continually evaluate how their activities are helpful for understanding their own works (Felder & Silverman,1998, Mills, 2004). Since the teaching approach does not centralize the transfer of knowledge from the lecture to the student, it is seen to be more successful (Lindquist,1995) and also it motivates goal- oriented behavior among students, this is very effective in improving student achievement (Slavin,1995). Ayeni (2011) states that teaching is an ongoing process that entails using appropriate methods to help students improve in ways that are desired. According to Adunola (2011), teachers should employ the most successful methods of instruction for the material they are teaching in order to effect the desired changes in their students. Moreover, Bharadwaj and Pal (2011) upheld that as each student perceives and reacts to questions in a unique way. The major way that teaching approaches operate effectively is if they satisfy the demands of the learners (Chang,2010). Accordingly, suitable teaching methods to students' requirements and preferred learning styles affect their academic performance (Zeeb, 2004). According to Ndirangu (2007) a teacher's decision about a certain teaching technique is influenced by a variety of elements, such as the subject matter to taught, the goals the teacher intends to accomplish, the availability of teaching and learning resources, and teachers' ability and willingness to adapt in the event that traditional teaching aids are unavailable for the assessment and follow- up exercise to verify individual differences of students. Ayeni (2011) asserts that the process of teaching involves bringing about desired changes in students in order to accomplish particular goals. Adunola (2011), concluded that for a teaching technique to be effective, instructors must be knowledgeable about a variety of teaching methods that take into account the complexity of the subject matter.

It is crucial for educators, policymakers and curriculum developers to comprehend how teaching methods affect students' learning outcomes in Mathematics. Through a comprehensive analysis of the efficiency of many instructional methodologies, this study can give significant insights into optimal practices for Mathematics Education. The results of study may lead to the development of teaching methods to improve student interest, understanding, and mathematical concept competency. Furthermore, prospective teachers are the face of educational system, and the education they get now will greatly influence how pupils learn in the years to come. The study can provide guidance for teacher education programmes and professional development activities by investigating the views, and experiences of aspiring teachers in relation to Mathematics teaching methods. Also, evaluation of teaching methods in Mathematics education supports more general learning objectives including developing students' abilities for critical thinking, problem- solving, and mathematical literacy. Through enhancing mathematical learning outcomes, the study can support larger initiatives to raise educational fairness and get children ready for a world that is changing rapidly.

### Objective of the study

- To analyze the perception on effectiveness of teaching methods on learning outcomes in Mathematics among prospective teachers at secondary level

### Methodology

The study adopted survey method

#### Sample

The population for the study comprised of prospective teachers at secondary level, i.e. those who are studying in various B.Ed. colleges of Kerala state. The present study was conducted on a sample of 50 prospective teachers at secondary level selected from Thrissur district of Kerala State.

#### Tool

The tool used for collecting the required information is Questionnaire on Effectiveness of Teaching methods on Learning Outcomes in Mathematics (Radhika & Niranjana, 2024). The questionnaire was constructed by considering the dimensions such as confidence in implementing teaching methods, influence of attitude on instructional choices, and preparedness to adapt teaching methods. The questionnaire consists of 15 items related to the above dimensions. The validity of the questionnaire was ensured by using face validity and content validity. The reliability of the scale was ensured by using Cronbach's Alpha. The reliability coefficient of the tool was 0.51, which indicates the questionnaire is reliable.

### Analysis and Discussion

In order to analyze the prospective teachers' perceptions on effectiveness of teaching methods on learning outcomes in Mathematics, the investigator used percentage analysis.

**Percentage Analysis of Responses of Prospective Teachers on the Dimension of Confidence in Implementing Teaching Methods**

The collected data were analyzed by using percentage analysis to understand the confidence of prospective teachers in implementing teaching methods among secondary school students. The result of percentage analysis of responses of prospective teachers on the dimension of confidence in implementing teaching methods is given in Table 1.

Table 1

**Percentage Analysis of Responses of Prospective Teachers on the Dimension of Confidence in Implementing Teaching Methods**

No	Item	Yes (percentage)	No (percentage)
1	Impact of teaching methods on learning outcomes in Mathematics.	86	14
2	Confidence in implementation of teaching methods	84	16
3	Effectiveness of teaching method	84	16
4	Strategies to face challenges	84	16
5	Assessment of teaching methods	86	14
6	Student preparedness and learning outcome	80	20
<b>Mean</b>		84	16

**Discussion**

Table 1 shows the confidence of prospective teachers in implementing teaching methods and 86 percent of prospective teachers acknowledge the significant impact of teaching methods on students' learning outcomes in Mathematics. This result indicates respondents believe that the existing instructional methods are helpful in facilitating student success. A large proportion (84 percent) of prospective teachers express confidence in their ability to effectively implement variety of teaching methods. This suggests that most respondents feel adequately prepared and competent to utilize diverse instructional approaches in their teaching-learning process.

Among the respondents, 84 percent of prospective teachers perceive teaching methods are effective for promoting positive learning outcomes in Mathematics. This result indicates that the prospective teachers viewed existing instructional strategies are appropriate in supporting student achievement. Majority of respondents (84 percent) indicate that the strategies employed are helpful to overcome challenges or barriers faced by the learners in learning mathematics. This indicates that prospective teachers believe that existing teaching methods are helpful in addressing challenges in instruction.

Most of the respondents (86 percent) report that existing teaching methods are effective in promoting student learning outcomes in Mathematics. This indicates that the prospective teachers support the effectiveness in evaluating the learning outcomes by using different methods. Among the respondents 80 percent of respondents perceive that level of preparedness of students to implement teaching methods and student learning outcomes in Mathematics are related. Thus, the results reveal that prospective teachers believe that their readiness and proficiency in instructional delivery impact student achievement.

The results of analysis of perception of prospective teachers on confidence in implementing teaching methods point out a positive outlook among prospective teachers regarding their confidence in implementing teaching methods and their understanding of the link between instructional strategies and students learning outcomes. These finding emphasize the importance of supporting prospective teachers in developing a diverse range of success of effective teaching methods and fostering a reflective approach to instructional practice. Similarly, Han (2021) supported that the teaching strategies not only support students but also promote teachers' self-concept about teaching.

**Percentage Analysis of Responses of Prospective Teachers on the Dimension of Influence of Attitude on Instructional Choices**

The collected data were analyzed to understand the influence of attitude on instructional choices of prospective teachers by using percentage analysis. The results of percentage analysis of responses of prospective are given in Table 2.

Table 2

*Percentage Analysis of Responses of Prospective Teachers on the Dimension of Influence of Attitude on Instructional Choices*

No	Item	Yes (percentage)	No (percentage)
1	Attitude towards teaching methods	84	16
2	Professional development	88	12
3	Preparedness to adapt teaching methods	84	16
4	Supporting resources	84	16
5	Student Achievement	88	12
6	Student engagement and motivation	86	14
	<b>Mean</b>	<b>85.66</b>	<b>14.33</b>

**Discussion**

Table 2 shows the perception of prospective teachers on influence of attitude on instructional choices of prospective teachers. Among the respondents, 84 percent of prospective teachers perceive that their attitude towards teaching methods play a crucial role in determining their instructional choices in Mathematics. Thus, it is evident that the personal beliefs and preferences on teaching practices are determining factor in instructions choices.

Majority (88 percent) of prospective teachers indicates a strong belief in the value of professional development in enhancing preparedness to implement teaching methods effectively. The results indicate the importance of ongoing training and learning opportunities for educators to stay updated with best practices in Mathematics education. Most of the prospective teachers (84 percent) express their preparedness to adapt teaching methods to meet the diverse needs of students to study Mathematics. This flexibility and willingness to adjust instructional strategies align with the principle of differentiation and inclusivity in education.

Among the respondents, 84 percent of prospective teachers recognize the significance of supporting resources which facilitate effective implementation of teaching methods in Mathematics. This highlights the importance of teaching materials, and assistance in creating conducive learning environments. Majority (88 percent) of prospective teachers perceive a relationship between attitude towards teaching methods and student achievement in Mathematics. This underscores the beliefs in the influence of teachers' attitudes and instructional practices on student outcomes.

From the responses of the prospective teachers, it is evident that 86 percent of respondents acknowledge the impact of their attitude towards teaching methods in student engagement and motivation in Mathematics. This emphasizes the role of prospective teachers as facilitators of learning and motivators of student participation.

Thus, the analysis of influence of attitude on instructional choices indicate a strong consensus among prospective teachers regarding the importance of attitude, professional development, adaptability, resources and their perceived impact on teaching effectiveness and student achievement in mathematics. These finding indicates the need for continuous professional growth, flexible instructional approaches, and adequate support systems to promote optimal learning outcomes in Mathematics education. Moreover, study conducted by Stewart and Houchens (2014) concluded that teachers who involved more in ongoing, sustained professional development have obtained a better understanding of assessing student learning, and so enhance their instructional performance. Prilleltensky et al. (2016) supports that professional development opportunities may be able to help teachers improve their well being and deal with classroom management and stress.

*Percentage Analysis of Responses of Prospective Teachers on the Dimension of Preparedness to Adapt Teaching Methods*

The collected data were analyzed to understand preparedness of prospective teachers to adapt teaching methods by using percentage analysis. The results of percentage analysis of responses of prospective teachers on the dimension of preparedness to adapt teaching methods are given in Table 3

Table 3

*Percentage Analysis of Responses of Prospective Teachers on the Dimension of Preparedness to Adapt Teaching Methods*

No	Item	Yes(percentage)	No (percentage)
1	Diverse needs of students	82	18
2	Lack of resources or support	64	36
3	Challenges in implementing	76	24
<b>Mean</b>		<b>74</b>	<b>26</b>

## Discussion

Table 3 shows the perception of prospective teachers' preparedness to adapt teaching methods. Among the respondents 82 percent of the prospective teachers express their readiness to adapt teaching methods to meet the diverse needs of students in Mathematics. The results indicate that prospective teachers have positive attitude towards the instructional flexibility and response to the individual learning styles, ability, and background of students. Educators who are prepared to adapt their teaching methods are better equipped to create inclusive learning environments and address the varied needs of their students effectively.

Majority of prospective teachers (64 percent) report that the lack of resources or support hinders their ability for effectively implementing teaching methods in Mathematics. This result highlights a potential challenge faced by educators in accessing essential resources or support can limit educators' capacity to implement innovative teaching methods and provide quality education, potentially impacting student learning outcomes.

Most (76 percent) of prospective teachers reported that they are facing challenges when implementing new teaching methods in Mathematics. Manning and Bucher (2007) concluded that unprepared and disorganized teachers will most likely encounter behavior problems. This indicates about the awareness of the complexities involved in adopting and integrating innovative instructional approaches into classroom practice. Common challenges may include resistance to change, time constraints, lack of training or experience, and concern about student receptivity. Among the anticipated challenges, the majority percentage of prospective teachers who express preparedness to confront them demonstrates willingness to overcome challenges and enhance teaching effectively through continuous learning and adaptation.

## Conclusion

The overall result of the study highlights a strong consensus among prospective teachers about a vital role of attitude, professional development, adaptability, and resources in teaching effectiveness and student achievement. This consensus indicates that the foundation for professional growth is well-organized among future educators. A strong positive perceptions and readiness among educators, addressing challenges related to resource availability and implementation barriers is vital for realizing the full potential of teaching methods in mathematics education. The willingness of prospective teachers to confront the challenges through continuous learning and adaptation is encouraging. It indicates a proactive approach to overcoming obstacles and enhancing teaching effectiveness. This readiness to adapt underscores the necessity for robust support system, flexible instructional approaches, and adequate resources to facilitate innovative teaching practice. Thus, by working collaboratively and supportive initiatives stakeholders can create an environment conducive to effective teaching practices and meaningful student learning outcomes in Mathematics.

## References

- Adunola, O. (2011). *The impact of teachers' teaching methods on the academic performance of primary school pupils in Ijebu-ode local cut area of Ogun state.* <https://api.semanticscholar.org/CorpusID:15331823>
- Arbaugh, B. (2000). *How classroom environment and student engagement affect learning in internet-based MBA courses.*63(4), 9-26. University of Wisconsin. <http://dx.doi.org/10.1177/108056990006300402>
- Ayeni, A.J. (2011), Teachers professional development and quality assurance in Nigerian Secondary Schools, *World Journal of Education*, 1(2),143-149. <http://doi:10.5430/wje.v1n2p143>
- Chang, W. (2002), Interactive teaching approach in year one university physics in Taiwan: Implementation and evaluation, *Asia-Pacific Forum on Science Learning and Teaching*, 3(1),1-21. [https://www.researchgate.net/publication/26411376\\_Interactive\\_Teaching\\_Approach\\_in\\_Year\\_One\\_University\\_Physics\\_in\\_Taiwan\\_Implementation\\_and\\_Evaluation](https://www.researchgate.net/publication/26411376_Interactive_Teaching_Approach_in_Year_One_University_Physics_in_Taiwan_Implementation_and_Evaluation)

- Damodharan V. S. & Rengarajan, V. (1999), Innovative methods of teaching, In *Learning Technologies and Mathematics Middle East Conference, Sultan Qaboos University, Muscat, Oman. 1-6.* <https://www.researchgate.net/publication/347306546>  
*Innovative Methods of Teaching*
- Felde, R. M., Silverman, L.K. (1998). Learning and teaching styles in engineering education. *Engineering Education*, 78(7): 674-681. <https://www.researchgate.net/publication/257431200> *Learning and Teaching Styles in Engineering Education*
- Garfield, J. (1995). How students learn statistics. *International Statistical Review*. 63(1), 25-34. <https://doi.org/10.2307/1403775>
- Han, F. (2021). The relations between teaching strategies, students' engagement in learning, and teachers' self-concept. *Sustainability*, 13 (9). <https://doi.org/10.3390/su13095020>
- Lindquist, T. M. (1995). Traditional versus contemporary goals and methods in accounting education: Bridging the gap with cooperative learning. *Journal of Education for Business*, 70(5), 278-284. <https://eric.ed.gov/?id=EJ507824>
- Manning, M. L., & Bucher, K. T. (2007). *Classroom management: Models, applications and cases* (2nd.ed.). Pearson Merrill Prentice Hall.
- McBrie, J. L., & Jones, P. (2009). Virtual Spaces: Employing a synchronous online classroom to facilitate students' engagement in online learning. *International Review of research in open and distance learning*, 10 (3), 1492-3831. <http://dx.doi.org/10.19173/irrodl.v10i3.605>
- Mills, D.J. (2004). Learning abstract statistics concepts using simulation. *Education Research Quarterly*, 28(4), 18-33. <https://www.researchgate.net/publication/234656419> *Learning Abstract Statistics Concepts Using Simulation*.
- Prilleltensky, I., Neff, M., & Bessell, A. (2016). Teacher stress: What it is, why it's important, how it can be alleviated. *Theory Into Practice*, 55(2), 104–111. <https://doi.org/10.1080/00405841.2016.1148986>
- Rafiq, S., Afzal, A., & Kamran, F. (2022). Impact of school environment on students' academic achievements at the university level. *VFAST Transactions on Education and Social Sciences*, 10(4), 19-30. <https://doi.org/10.21015/vtess.v10i4.1216>
- Slavin, R.E. (1996), Research for the future- Research on cooperative learning and achievement: What we know, what we need to know, *Contemporary Educational Psychology*, 21(4), 43-69. <http://dx.doi.org/10.1006/ceps.1996.0004>
- Stewart, T. A., & Houchens, G. W. (2014). Deep impact: How a job-embedded formative assessment professional development model affected teacher practice. *Qualitative Research in Education*, 3(1), 51-82. <http://doi:10.4471/qre.2014.36>