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Digital Competence in the Teaching Profession: An Empirical Study of School Teachers

[1]Namrata Suhag and [*2]Dr. Raju Talreja

[1]Student, Bombay Teachers' Training College, HSNC University, Mumbai, Maharashtra, India.

[*2]Associate Professor, Bombay Teachers' Training College, HSNC University, Mumbai, Maharashtra, India.

Abstract

This study looks at how digitally skilled school teachers are, and whether there are any differences between male and female teachers in digital competence. The main goals were to see how well teachers use digital tools overall, how they perform in specific areas like preparing lessons, delivering content, supporting students, evaluating and improving their teaching, developing professionally, helping their school grow, and using new ideas in education. It also looked at whether factors like age, gender, or experience affect their digital skills.

The research was conducted using a survey method, and data was collected from 33 school teachers working in different schools across Mumbai.

The findings showed that female teachers scored higher than male teachers in most areas, especially in lesson preparation and teaching delivery, where the difference was clear and statistically significant. In areas like evaluation, professional development, school improvement, and trying out new ideas, the differences between male and female teachers were little and not significant enough to matter statistically.

Overall, while female teachers stood out in key areas like teaching preparation and delivery, both male and female teachers showed similar levels of digital skills in areas such as evaluation and revision, professional development, school development, and educational innovation. The findings indicate that teachers today are generally quite digitally capable, though there's still a need to offer equal support and training to help everyone grow even more.

Keywords: Digital Competence, Teacher Professional Development, Pedagogical Technology Integration, Gender Disparity in Education, School Teachers.

Introduction

Technology has become more critical and important in the teaching- learning process due to the dynamic digital world. It has become imperative for teachers to be digitally literate, especially having strong digital skills. Digital competency is the ability to use digital tools and resources effectively for varied teaching, learning and assessment purposes in order to engage students in a fruitful learning, communicate with parents and students, create interactive learning environments and assess students' progress. It has become very important for teachers to effectively learn and use these skills which in turn will prepare students for a future where technology plays a dominant role.

Metros like Mumbai interspersed with a wide range of schools varying vastly in terms of resources, infrastructure and changing educational needs, the level of digital literacy could vary and the teachers may face a lot of challenges. The challenges and limitations to enhance digital skills might include lack of suitable training, availability of digital resources and technology, limited internet facilities and devices. But in spite of these challenges, it is crucial for educators to enhance their digital skills in today's technology driven educational space. Building up on these skills will promote digital citizenship, improve learning experiences, increase engagement in classrooms, improve efficiency and student outcomes and support inclusive learning environments.

This study aims to examine the situation of digital competency of primary and secondary school teachers or educators in Mumbai, focusing on the importance of digital skills in the classroom and also identifying the challenges faced by teachers in their digital learning journey.

Review of Literature

Dipak Bhattacharya's study (2025) surveyed 60 secondary teachers in Murshidabad district of West Bengal with a self-designed 5 point Likert type questionnaire. The results showed gaps in teachers' digital literacy, due to insufficient training. The study also highlighted the challenges faced in analyzing student data, hindering personalized feedback. The study urged the need for professional development programs to foster digital skills and innovative assessment approaches.

***Corresponding Author:** Dr. Raju Talreja

Strengthening the digital competencies is important for empowering teachers to effectively integrate the digital skills in the classroom.

The study by Rawal (2024) focuses on assessing the competency of school teachers in India in terms of using sophisticated tools in teaching and training. She studied UDISE government data to place Indian states into three categories – high, moderate, and low – based on the availability of digital resources and teacher training. The findings of her study revealed that most states had maintained almost the same level of digital infrastructure over the 4 years and very few actually improved. There was also increased government spending, but teacher training in computer usage continued to decline post COVID-19. Also, the research emphasized the relationship between the level of digital infrastructure and teachers' functionality, stating that with sufficient resources, better training and technology would help address the educational digital divide. As a result, the study highlights the importance of supporting teachers with ongoing training, enhanced inter-school cooperation, and comprehensive assessments to ensure full preparedness for digital educational delivery among tutors.

Sharma's (2020) work addresses the challenges teacher educators encounter in integrating technology into their instruction and how those challenges might be resolved. This particular study, which was part of an ICSSR project, analyzed these issues through a descriptive research design. Though the precise number of participants and sites was not detailed, it was centered on teacher educators from India. This research particularly noted that many educators do not have the right training to enable them to use digital tools. It demonstrates the lack of adequate training programs that help teachers to search, evaluate, and apply digital materials within their teaching at the professional development level. With proper training, teacher educators would equip their students, who will be teachers, to modernize the educational system making it more efficient and productive.

Hassan and Mirza (2021) researched the perceptions of school teachers on the use of digital tools and technology in teaching in Rajouri, a district in the Indian-administered union territory of Jammu and Kashmir. The purpose of the study was to examine the barriers faced by teachers in the effective use of technology in teaching. The researchers collected data from teachers from various schools in the district and they observed that most of the teachers recognized the importance of technology in education. There were certain challenges also observed like lack of adequate training, resources, and confidence—that hindered full utilization. The researchers focused on the enhancement of digital competencies in teachers through greater support and greater opportunities to learn, which as a result would increase the effectiveness of technology integration in schools.

Tzafilkou, Perifanou, and Economides (2023) wanted to find out how well teachers use digital tools in their teaching and professional work. They made a survey with 20 questions that looked at six important areas, like how teachers prepare lessons, help students, improve their teaching, grow professionally, support their schools, and try new teaching ideas. They gave this survey to 845 teachers from primary and secondary schools in Greece. After carefully checking how the survey worked, they found it was a reliable way to measure digital skills. The results showed that many teachers didn't feel confident using digital tools, especially in certain areas. For example, primary school teachers often felt unsure about using digital tools during lessons and in their own learning. Female teachers felt less confident about trying new teaching methods and helping the school improve with digital tools, though they felt better about their own professional growth. This shows that different groups of teachers need different kinds of support to build their digital skills.

Bożena Pera, Agnieszka Hajdukiewicz, and Danijela Ferjanić Hodak researched how high school teachers and university instructors know and implement the use of digital tools in education. They sought to learn whether teaching experience matters in being more confident and proficient with technology. To accomplish this, they had teachers evaluate their own knowledge and ability to use ICT (Information and Communication Technology). Most teachers reported having a medium level of digital competence. Surprisingly, they reported a higher confidence level in their conceptual understanding of the digital domain rather than using the tools practically. Experience did impact their confidence and competence to a certain degree, but the outcomes differed based on the type of digital task in question. This study indicates that although most teachers are fairly familiar with technology, there is still room for improvement, particularly in actual use- so training and support must be made available to assist teachers in getting better and feeling more confident to use technology in the classroom.

Isrokatun, Pradita, Ummah, Amalia, and Salsabila carried out a study to understand how well future primary school teachers are prepared with digital skills important for classrooms of today. They talked to 30 students from a teacher education program in Sumedang, Indonesia, using interviews to learn more about their knowledge as well as comfort with technology. The study examined these four important areas: the degree to which students use digital tools (skills), the depth of their respect for digital culture, the nature of online ethical behaviors, and the manner in which they protect themselves from online risks. The findings showed students see digital skills as being helpful in their daily tasks, digital culture as important for the keeping of traditions alive, digital ethics as a way to avoid problems that are online, and digital safety as a must for staying secure within the digital world. The researchers believe that it's important for these future teachers to be strong in all these areas. Therefore, they can use technology confidently and safely in their future classrooms.

Jo Tondeur, Sarah K. Howard, and Jie Yang (2021) wanted to find out how future teachers, also called preservice teachers, learn to use technology effectively in teaching. They believed that not all future teachers learn the same way because their attitudes toward technology can be very different. To explore this, they asked 931 teacher trainees from 20 different teaching colleges in Belgium to fill out a survey. They looked at how these trainees responded to six different teaching methods for building digital skills. Using a data analysis method called association rules analysis, they searched for patterns in how students with high and low interest in technology used different strategies. They found that students who felt more confident and positive about technology focused more on working together (collaboration), while those who felt less confident needed more support through feedback. This study shows that teacher training should not treat all students the same. Instead, it should be flexible and adjust to each student's learning needs. This can help create better training programs that support all kinds of future teachers in becoming confident with using technology.

In their research, Bożena Pera, Agnieszka Hajdukiewicz, and Danijela Ferjanić Hodak explored how teaching experience

influences the digital skills of high school teachers and university professors. They conducted a survey in which educators rated their own digital knowledge and practical skills - such as using computers, online platforms, and other digital tools for teaching. The results showed that most teachers had a moderate level of digital competence, feeling slightly more confident in their understanding of technology than in actually applying it. Interestingly, the study found that teaching experience impacted how comfortable educators were with using digital tools, and there were noticeable differences between school and university teachers. The authors emphasized the need for focused training programs to help teachers strengthen specific areas of digital competence, so they can better adapt to modern teaching needs in a technology-rich environment.

The study by Lucas *et al*. (2021) looked at what influences teachers' ability to use digital tools in their teaching. They created a questionnaire based on a European framework to measure how confident and skilled teachers are with digital technology. Over 1,000 teachers took part in the study. The researchers found that personal factors- like how many digital tools teachers already use, how easy they find them to use, how confident they feel, and how open they are to trying new technology- had a bigger impact on their digital skills than things like school resources or support from their workplace. The tool they used to measure digital competence was shown to be accurate and reliable. The study suggests that to help teachers improve their digital skills, training programs should focus more on building confidence and encouraging openness to technology.

The study by Ottenbreit-Leftwich and colleagues (2018) looked at how new teachers learn to use technology in their teaching and what helps or gets in the way. They followed four teachers over time - from when they were finishing college, through student teaching, and then into their first two years of full-time teaching. The teachers had strong knowledge and confidence with using technology because of their training, but putting it into practice in real classrooms was harder. Things like school support, access to resources, and the overall school environment made a big difference. Even though the teachers wanted to use tech, they couldn't always do it the way they planned. The study shows that to really help new teachers use technology well, schools need to give them the right tools and support.

Objectives

i). To assess the overall level of digital competence among school teachers.

ii). To ascertain the level of digital competence among school teachers with regard to the following dimensions:
- Teaching Preparation
- Teaching Delivery and student support
- Teaching Evaluation and Revision
- Professional Development
- School's Development
- Innovating Education

iii). To determine the effect of demographic variables (e.g., age, gender, teaching experience) on teachers' digital competence.

Hypothesis

H_{01}: There is no significant difference in the overall digital competence scores between male and female school teachers.

H_{02}: There is no significant difference in the digital competence scores across various dimensions between male and female school teachers.

Research Methodology

The present study used a descriptive survey design, a non-experimental research design which scientifically collects data to describe the characteristics of the participants viz. are the teachers without manipulating variables.

Sample and Sampling Technique

A total of 33 teachers participated in the study.

To understand the status of digital competence amongst primary and secondary school teachers in Mumbai, a random sampling technique was used to collect data from in-service school teachers in different schools in Mumbai.

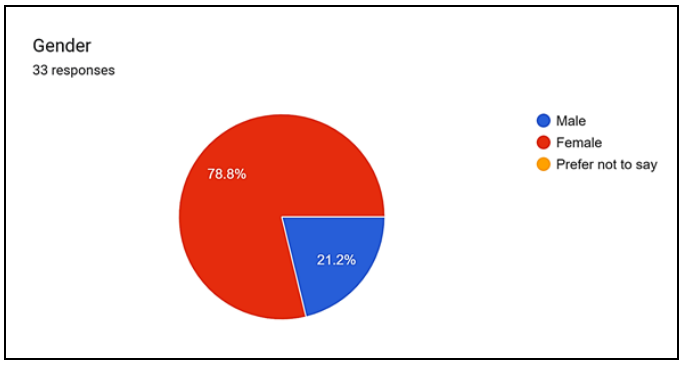

Fig 1: Figure showing the gender distribution of the sample

The above figure shows that out of 33 responses, 21.2% are male teachers and 78.8% are female teachers.

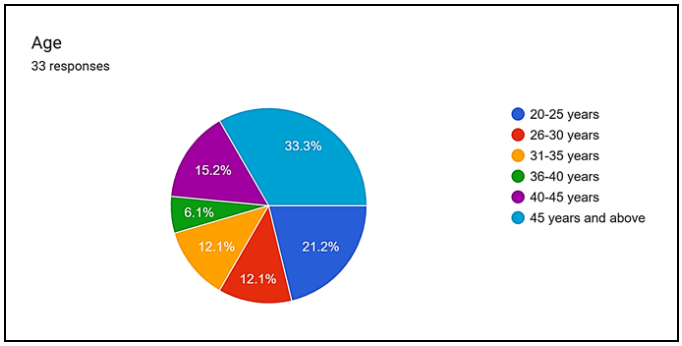

Fig 2: Figure showing the age wise distribution of the sample

The above figure shows that out of 33 responses, 21.2% sample are in the age group of 20 to 25 years, 12.1% are from the age group of 26 to 30 years, 12.1% from 31 to 35 years, 6.1% from 36 to 40 years, 15.2% from 40 to 45 years and 33.3% from above the age of 45 years.

Tool and Technique

The instrument used is a 20 item questionnaire that was developed by Tzafilkou, K., Perifanou, M. & Economides, A.A. by building upon the framework by Petrifanou *et al.* (2021) which categorises digital competence into six areas:
- Teaching Preparation
- Teaching Delivery and student support
- Teaching Evaluation and Revision
- Professional Development
- School's Development
- Innovating Education

All items are measured on a 5-point likert scale (Not at all,

Slightly, Moderately, Very and Excellent) that measures "to what extent do they use digital tools for the following?" The items of the instrument are based on the questionnaire developed in Perifanou *et al*. (2021)

Data Collection

The questionnaire was mailed to the selected sample of teachers. The form included the study's purpose and ensured confidentiality and anonymity to elicit honest responses.

Findings

The data reveals a consistent trend where female teachers generally outperform male teachers in core pedagogical areas, specifically in preparation and delivery. However, in more specialized or administrative areas like professional development and innovation, the differences between genders become statistically negligible.

Dimensional Breakdown

i). Pedagogical Excellence: Preparation and Delivery

In Dimension 1 (Teaching Preparation) and Dimension 2 (Teaching Delivery & Students' Support), female teachers demonstrate a clear and statistically significant advantage.

- **Preparation:** Females averaged a score of 10.73 compared to the male average of 7.29. The t-test ($p = 0.0176$) confirms this gap is significant.
- **Delivery:** Similarly, in Dimension 2, females scored significantly higher (16.62) than males (11.71).

In both cases, the p-values are well below the 0.05 threshold, indicating that these are not random occurrences but represent a genuine difference in reported performance levels.

ii). Consistency in Evaluation and School Development

For Dimension 3 (Evaluation and Revision) and Dimension 5 (School's Development), both groups perform at a moderately high level. While female averages remain slightly higher (approx. 12.92 vs. 11.00 in Dimension 3), the t-test results ($p > 0.05$) indicate that these differences are not statistically significant. This suggests that both genders contribute relatively equally to the broader institutional growth and internal assessment processes.

iii). Professional Growth and Innovation

Interestingly, Dimension 4 (Professional Development) and Dimension 6 (Innovating Education) are the only areas where male teachers showed slightly higher mean scores than females.

- **Innovation:** Males averaged 6.86 against the female 6.15.
- **Development:** Males averaged 6.86 against the female 6.38.

Despite the higher means for men, the high p-values (0.541 and 0.688, respectively) indicate no significant difference. Both groups show moderate, consistent engagement in these areas.

Statistical Considerations

A critical factor in this analysis is the sample size disparity. With only 7 male participants compared to 26 females, the male data exhibits higher Standard Errors and wider Confidence Intervals. This smaller "n" makes it harder to reach statistical significance unless the difference in means is very large.

Summary

The data shows that while female teachers excel significantly in preparation and student support, both genders operate on a similar level regarding professional growth, school development, and educational innovation.

Conclusion

Looking at all the data together, the biggest takeaway is that female teachers consistently lead the way when it comes to the "heart" of teaching- specifically, how they prepare for class and how they deliver their lessons to support students. In these two areas, the higher scores for women weren't just a coincidence; the math shows a clear, significant gap compared to the men. On average, female teachers scored about 10.7 in preparation and 16.6 in delivery, while male teachers trailed behind at 7.3 and 11.7. This suggests that the women in this group are putting in more detectable effort or feel more confident in their day-to-day classroom habits.

However, when we move away from the classroom and look at things like professional development, school-wide growth, and coming up with new, innovative ideas, the playing field levels out. While the men actually had slightly higher average scores in things like innovation (6.86 vs. 6.15), the difference was so small that it could have easily happened by chance. Essentially, both men and women are performing at a very similar, moderate level when it comes to improving themselves and their schools.

The only real catch in the data is that there were far fewer men (only 7) compared to women (26). Because the male group was so small, their scores jumped around a lot more, making it harder to say their results represent all male teachers. In the end, the study shows that while everyone is equally committed to growing as professionals, there is a real opportunity to help male teachers close the gap in how they plan and deliver their daily lessons to match the high standards set by their female colleagues.

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