



# The Influence of Digital Pedagogical Competence on Teacher Effectiveness and Student Engagement among Secondary School Teachers

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## Abstract

The present study investigated the influence of Digital Pedagogical Competence on Teacher Effectiveness and Student Engagement among secondary school teachers. A descriptive survey method was employed, and the study was conducted on a sample of 150 secondary school teachers selected through stratified random sampling from Guntur district of Andhra Pradesh. Data were collected using a self-constructed Digital Pedagogical Competence Scale, a Student Engagement Scale, and the Kulsum Teacher Effectiveness Scale (KTES) developed by Umme Kulsum (2000). Statistical techniques such as mean, standard deviation, t-test, and Pearson's product-moment correlation were used for data analysis. The findings revealed significant differences in Digital Pedagogical Competence, Teacher Effectiveness, and Student Engagement with respect to gender and locality. Female teachers demonstrated higher levels of Digital Pedagogical Competence, Teacher Effectiveness, and Student Engagement than male teachers. Urban teachers exhibited higher Digital Pedagogical Competence and Student Engagement, whereas rural teachers showed greater Teacher Effectiveness. The study further revealed a strong positive relationship between Digital Pedagogical Competence and Teacher Effectiveness as well as Student Engagement. The findings indicate that teachers with higher levels of digital pedagogical competence

are more effective in their teaching practices and are better able to promote student engagement. The study highlights the importance of strengthening digital pedagogical competencies among teachers to improve instructional quality and learning outcomes in secondary education.

**Keywords:** Digital Pedagogical Competence, Teacher Effectiveness, Student Engagement, Secondary School Teachers, Educational Technology.



## I. INTRODUCTION

The relationship between teachers and Generation Z (Gen Z) students plays a crucial role in the teaching-learning process. Gen Z, generally born between 1997 and 2012, are often referred to as "digital natives" because they have grown up with smartphones, social media, and instant access to information. Unlike previous generations, they prefer interactive, technology-supported, and personalized learning experiences. As a result, the traditional teacher-centered approach is gradually being replaced by a more collaborative and student-centered relationship.

In schools, teachers are no longer viewed solely as sources of knowledge but also as facilitators, mentors, and guides. Gen Z students value teachers who are approachable, supportive, technologically competent, and respectful of their opinions. A positive teacher-student relationship fosters trust, motivation, engagement, and academic success. When teachers understand students' interests, learning preferences, and emotional needs, students are more likely to participate actively in classroom activities and develop a positive attitude toward learning.

Effective communication is another important aspect of the teacher-Gen Z relationship. Gen Z students appreciate immediate feedback, open discussions, and opportunities to express their ideas. Teachers who integrate digital tools, collaborative activities, and real-world applications into their teaching can better connect with these learners. Such practices enhance student engagement and create a more meaningful learning environment.

However, challenges may arise due to differences in technological familiarity, communication styles, and expectations between teachers and Gen Z students. Teachers may need continuous professional development to adapt to evolving educational technologies and student needs. At the same time, students must learn to use technology responsibly and maintain respect for classroom norms and teacher authority.

Overall, a strong teacher-Gen Z relationship is characterized by mutual respect, effective communication, emotional support, and meaningful technology integration. Such a relationship not only improves teacher effectiveness and student engagement but also prepares students to thrive in the rapidly changing digital world.

## II. DIGITAL PEDAGOGICAL COMPETENCE OF TEACHERS

Digital Pedagogical Competence refers to a teacher's ability to effectively integrate digital technologies into teaching and learning processes to enhance educational outcomes. In the digital era, teachers are expected to possess technical skills and understand how technology can be used to support pedagogy, improve classroom interaction, and facilitate meaningful learning experiences (Kiryakova & Kozhuharova, 2024). Digital pedagogical competence combines technological knowledge, pedagogical understanding, and professional skills that enable teachers to use digital tools effectively in education.

The increasing use of digital technologies in schools has transformed the role of teachers from mere transmitters of knowledge to learning facilitators. Teachers with strong digital pedagogical competence can design technology-enhanced lessons, utilise digital resources, and create interactive learning environments that cater to diverse student needs (Stolba & Kay, 2021). They can select appropriate digital tools and integrate them into classroom instruction to make learning more engaging, collaborative, and learner-centred.

Another important aspect of digital pedagogical competence is the ability to assess and monitor students learning through digital means. Teachers can employ online assessments, educational applications, learning management systems, and digital feedback mechanisms to track students' progress and provide timely support to them. The use of digital assessment tools not only improves efficiency but also enables teachers to make data-driven instructional decisions that enhance student achievement and engagement.

Digital pedagogical competence also involves effective communication and collaboration using technology. Teachers use digital platforms to interact with students, parents, and colleagues, facilitating information sharing and collaboration. Furthermore, competent teachers create and manage digital content, such as presentations,



videos, online activities, and multimedia resources, that enrich the teaching-learning process. They also encourage students to become responsible and ethical technology users (Asagar, 2025).

In contemporary education, digital pedagogical competence has become an essential competency for teachers. It contributes significantly to teacher effectiveness by improving the instructional quality, classroom management, and student participation. Moreover, it promotes student engagement by creating dynamic, interactive, and personalised learning experiences for students. Therefore, developing teachers' digital pedagogical competence is crucial for enhancing educational quality and preparing learners to succeed in an increasingly digital world.

### III. TEACHER EFFECTIVENESS

Teacher effectiveness refers to the extent to which teachers successfully facilitate student learning, promote academic achievement, and create positive learning environments. Effective teachers possess the knowledge, skills, attitudes, and professional competencies necessary to support students' intellectual, social and emotional development. Teacher effectiveness is a multidimensional construct encompassing various aspects of teaching practice, including planning, classroom management, instructional delivery, assessment, and interpersonal relationships (Ahmad Ganai, 2023). In the present study, teacher effectiveness is conceptualised through five dimensions: preparation and planning for teaching, classroom management, discipline and motivation, evaluation practices and instructional interaction, knowledge and delivery of subject matter, and teacher characteristics and interpersonal relationships.

**Preparation and Planning for Teaching** is a fundamental dimension of teacher effectiveness. Effective teachers carefully plan lessons by identifying learning objectives, selecting appropriate teaching methods, organising instructional materials, and considering students' diverse learning needs. Systematic planning helps teachers deliver content in a structured and meaningful manner, ensuring that classroom activities align with curriculum objectives. Well-prepared teachers are better equipped to manage instructional time efficiently and provide engaging learning experiences that promote student achievement (Swargiary & Roy, 2023).

**Classroom Management, Discipline, and Motivation** refer to a teacher's ability to create and maintain a positive, orderly, and supportive learning environment. Effective teachers establish clear expectations, implement fair disciplinary practices, and encourage students to participate actively in classroom activities (Wentzel, 2013). They foster a climate of respect, cooperation, and responsibility while motivating students to develop interest and confidence in learning. Strong classroom management skills minimize disruptions, maximize instructional time, and contribute to improved student engagement and academic performance.

**Evaluation Practices and Instructional Interaction** involve the systematic assessment of student learning and the quality of communication between teachers and students during the teaching-learning process. Effective teachers use various assessment techniques to monitor student progress, identify learning difficulties, and provide constructive feedback. They encourage questioning, discussion, and active participation, creating opportunities for meaningful instructional interactions. Through continuous evaluation and responsive teaching practices, teachers can adapt their instruction to meet students' needs and enhance learning outcomes (Chamisah, 2024).

**Knowledge and Delivery of Subject Matter** represent a teacher's mastery of the content they teach and their ability to communicate it effectively to students. Effective teachers possess a thorough understanding of subject concepts and employ appropriate instructional strategies to make learning meaningful and understandable (Tawa Ahmed & Olayinka Shogbesan, 2023). They explain complex ideas clearly, connect the content to real-life situations, and encourage critical thinking among students. Along with subject expertise, effective delivery ensures that students remain engaged and develop a deeper understanding of the subject.

**Teacher Characteristics and Interpersonal Relationships** focus on the personal and professional qualities that influence interactions with students, colleagues, and the school community. Effective teachers demonstrate empathy, patience, fairness, enthusiasm, and commitment to their students' success. They build positive



relationships based on trust, respect, and mutual understanding, which contribute to students' emotional well-being and academic motivation (Wentzel, 2015). Strong interpersonal relationships foster a supportive classroom environment in which students feel valued, confident, and encouraged to achieve their full potential.

#### IV. STUDENT ENGAGEMENT

Student engagement refers to the degree of attention, interest, participation, and commitment that students demonstrate during the learning process. It is a multidimensional construct that reflects how actively students are involved in academic activities and how connected they feel to their learning experience. Engaged students are more likely to attend classes regularly, participate in learning activities, invest effort in their studies, and achieve better academic results. In secondary education, student engagement plays a crucial role in promoting academic success, motivation, and overall development (Wang, 2025). This study conceptualises student engagement through four dimensions: behavioural, emotional, cognitive, and agentic engagement.

**Behavioural Engagement** refers to students' active participation in academic and school-related activities. It includes observable behaviours such as attending classes regularly, completing assignments on time, following classroom rules, participating in discussions, and contributing to group activities, among others. Students who exhibit high behavioural engagement demonstrate persistence, effort, and commitment to their learning tasks. This dimension reflects the extent to which students are involved in the instructional process and actively participate in classroom learning experiences (King, 2020).

**Emotional Engagement** refers to students' affective reactions toward learning, teachers, classmates, and the school environment. It includes feelings of interest, enjoyment, belongingness, satisfaction, and enthusiasm toward educational activities. Emotionally engaged students develop positive relationships with their teachers and peers and experience a sense of connection with their school (Wetherell, 2021). Such positive emotions enhance motivation, reduce feelings of boredom or anxiety, and encourage students to participate more actively in learning.

**Cognitive Engagement** refers to the psychological investment and mental effort that students devote to learning. It involves the use of higher-order thinking skills, self-regulated learning strategies, problem-solving abilities, and willingness to understand complex concepts. Cognitively engaged students seek meaningful understanding rather than rote memorisation, connect new knowledge with prior experiences, and apply the concepts they have learned to different situations. This dimension reflects students' commitment to deep learning and academic growth (Pohl, 2020).

**Agentic Engagement** refers to students' proactive contribution to the teaching-learning process by expressing their ideas, preferences, and learning needs. Students with high agentic engagement take the initiative in their learning by asking questions, seeking clarification, offering suggestions, and actively shaping classroom activities. Rather than being passive recipients of instruction, they collaborate with teachers to improve their learning experience. Agentic engagement promotes autonomy, self-confidence, and a sense of ownership over learning, making students active partners in the educational process (Montenegro, 2017).

Together, behavioural, emotional, cognitive, and agentic engagement provide a comprehensive understanding of how students participate in and experience the learning process. These dimensions are interrelated and collectively contribute to improved academic achievement, motivation, classroom participation, and overall educational success. Therefore, fostering student engagement remains a key objective for teachers and schools seeking to create meaningful and effective learning environments for students.

#### V. RELATIONSHIP AMONG DIGITAL PEDAGOGICAL COMPETENCE, TEACHER EFFECTIVENESS, AND STUDENT ENGAGEMENT AMONG SECONDARY SCHOOL TEACHERS

Digital Pedagogical Competence, Teacher Effectiveness, and Student Engagement are closely interconnected constructs in contemporary education. As schools increasingly integrate digital technologies into teaching and learning processes, teachers are expected to possess the competencies required to use technology effectively for



instructional purposes. Digital Pedagogical Competence enables teachers to design engaging learning experiences, implement innovative teaching strategies, assess student learning through digital tools, and facilitate meaningful classroom interactions (Akhtar, 2025). These competencies directly influence the quality of teaching and, consequently, students' participation and engagement in learning.

Digital Pedagogical Competence contributes significantly to Teacher Effectiveness by enhancing teachers' ability to plan lessons, deliver instruction, manage classrooms, and evaluate student performance using technology. Teachers with strong digital pedagogical skills can integrate multimedia resources, educational applications, virtual learning environments, and interactive digital tools into their teaching practices (Kiryakova & Kozhuharova, 2024). Such integration helps make lessons more organised, relevant, and learner-centred for students. As a result, teachers become more effective in achieving instructional objectives, addressing diverse learning needs, and creating productive learning environments.

Digital Pedagogical Competence also plays an important role in promoting Student Engagement. Secondary school students, particularly those belonging to Generation Z, are highly familiar with digital technologies and often prefer interactive and technology-supported learning experiences. When teachers effectively use digital tools, online resources, simulations, educational games, and collaborative platforms, students become more interested in and actively involved in learning activities (Girdzijauskienė et al., 2022). Technology-enhanced instruction can stimulate students' behavioural participation, emotional interest, cognitive investment, and agentic involvement, thereby strengthening their overall engagement.

Teacher Effectiveness serves as an important link between Digital Pedagogical Competence and student engagement. Effective teachers utilise their digital competencies to create meaningful learning experiences, maintain classroom discipline, provide timely feedback, and encourage active participation in the learning process. Through effective instructional practices, students develop a greater interest in learning, experience positive interactions with teachers, and become more motivated to achieve academic success (Zhu, 2023). Consequently, higher levels of teacher effectiveness often lead to increased student engagement in classroom- and school-related activities.

Therefore, a positive relationship is expected between Digital Pedagogical Competence, teacher effectiveness, and student engagement. Teachers with higher digital pedagogical competence are likely to be more effective in their teaching practices, which in turn fosters higher levels of student engagement. In the context of secondary education, strengthening teachers' digital pedagogical competence can enhance instructional quality, improve learning experiences, and promote active student participation (Erviana et al., 2025). Thus, Digital Pedagogical Competence may be viewed as a significant predictor of both Teacher Effectiveness and Student Engagement among secondary school teachers.

## VI. NEED AND SIGNIFICANCE OF THE STUDY

Digital Pedagogical Competence is a crucial factor influencing the quality of teaching and learning in secondary schools. Teachers with strong digital pedagogical competence can effectively integrate technology into instructional planning, classroom teaching, assessment practices, communication, and collaborative learning activities. These competencies enable teachers to utilise digital resources strategically to enhance learning experiences and address students' diverse needs. Therefore, Digital Pedagogical Competence can be considered a primary causal factor that influences both Teacher Effectiveness and Student Engagement (Erviana et al., 2025).

The first effect of Digital Pedagogical Competence is observed in Teacher Effectiveness. Teachers with higher levels of digital pedagogical competence are better prepared to design innovative lessons, manage technology-supported classrooms, employ digital assessment methods, and deliver subject matter effectively. Their ability to integrate technology into pedagogy improves instructional quality, classroom interaction, student motivation, and learning outcomes (Anggraini et al., 2024). Consequently, an increase in teachers' digital pedagogical competence is likely to lead to greater effectiveness.



The second effect of Digital Pedagogical Competence is reflected in Student Engagement. When teachers use digital tools, multimedia resources, interactive platforms, and collaborative learning technologies effectively, students become more actively involved in the learning process. Technology-enhanced instruction attracts students' attention, stimulates curiosity, promotes participation, and supports deeper learning. As a result, students exhibit higher levels of behavioural, emotional, cognitive, and agentic engagement in classroom activities (Prakash, 2026).

Teacher Effectiveness further influences Student Engagement. Effective teachers create positive learning environments, maintain classroom discipline, provide meaningful feedback, and encourage active participation in the learning process. Through effective instructional practices, students develop a greater interest in learning, feel more connected to their teachers and peers, and invest greater effort in academic activities. Thus, Teacher Effectiveness acts as an important mediating factor through which Digital Pedagogical Competence influences Student Engagement (Seo & Gibbons, 2019).

## VII. REVIEW OF RELATED LITERATURE

Bala and Kokla (2018) examined techno-pedagogical competence among 100 senior secondary school teachers. The study found no significant gender differences in techno-pedagogical competence; however, private school teachers demonstrated significantly higher competence than government school teachers. The findings highlighted the importance of school environment and technological exposure in developing teachers' techno-pedagogical skills.

Rabí Isla and Carballo Soca (2025) investigated the digital competence of upper secondary school teachers in Havana, Cuba. The study revealed that teachers possessed only a basic level of digital competence. While gender did not significantly influence digital competence, factors such as teaching specialization, work experience, age, access to digital resources, and frequency of social media use significantly affected the development of digital teaching competencies.

Tiwari et al. (2025) explored the relationship between creativity and teacher effectiveness among secondary school teachers. The findings indicated a moderate positive and significant relationship between creativity and teacher effectiveness. Creativity was found to be a significant predictor of teacher effectiveness, explaining 17% of its variance. The study emphasized the role of innovative teaching practices in improving instructional quality and student engagement.

S.S. and Vardhini (2017) studied the relationship between teaching aptitude and teacher effectiveness among secondary school teachers. The results revealed a significant positive relationship between teaching aptitude and teacher effectiveness. Female teachers were found to be more effective than male teachers, and private unaided school teachers demonstrated higher effectiveness compared to teachers from aided and government schools.

Vinay Kumar (2026) examined the effect of digital literacy on the teaching competence of secondary school teachers. The study found significant differences in digital literacy and teaching competence based on gender and locality. Female and urban teachers scored higher than their counterparts. Moreover, a strong positive relationship was observed between digital literacy and teaching competence, indicating that digitally literate teachers exhibit greater instructional effectiveness and professional competence.

The reviewed studies collectively indicate that digital and techno-pedagogical competencies, creativity, and teaching aptitude significantly contribute to teacher effectiveness and instructional quality. However, limited research has examined the combined influence of digital pedagogical competence on both teacher effectiveness and student engagement among secondary school teachers. Therefore, the present study seeks to address this gap by investigating the influence of digital pedagogical competence on teacher effectiveness and student engagement in secondary schools.



## VIII. OBJECTIVES

1. To find out the influence of the following variables on the Digital Pedagogical Competence of Secondary School Teachers i.e.

a. Gender: Male/Female

b. Locality: Urban/Rural

2. To find out the influence of the following variables on the Teacher Effectiveness of Secondary School Teachers i.e.

a. Gender: Male/Female

b. Locality: Urban/Rural

3. To find out the influence of the following variables on the Student Engagement of Secondary School Teachers i.e.

a. Gender: Male/Female

b. Locality: Urban/Rural

4. To find out the relationship among Digital Pedagogical Competence, Teacher Effectiveness and Students Engagement of Secondary School Teachers.

## IX. HYPOTHESES

1. There would be no Significance difference between Male and Female Secondary School Teachers Based on their Digital Pedagogical Competence.

2. There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Digital Pedagogical Competence.

3. There would be no Significance difference between Male and Female Secondary School Teachers Based on their Teacher Effectiveness.

4. There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Teacher Effectiveness.

5. There would be no Significance difference between Male and Female Secondary School Teachers Based on their Students Engagement.

6. There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Students Engagement.

7. There would be no Significance relationship between Digital Pedagogical Competence and Teacher Effectiveness and Students Engagement of Secondary School Teachers.

## X. METHODOLOGY

The present study was conducted on a sample of 150 secondary school teachers selected from the Guntur district of Andhra Pradesh through the stratified random sampling technique. A descriptive survey method was employed to collect quantitative data related to the study variables. Data were gathered using two self-developed instruments, namely the Digital Pedagogical Competence Scale and the Student Engagement Scale, while teacher effectiveness was measured using the Kulsum Teacher Effectiveness Scale (KTES) developed and standardized by Umme Kulsum (2000). The reliability of the instruments was established using Cronbach's alpha and test-retest methods. The Cronbach's alpha coefficients were found to be 0.89 for the Digital Pedagogical Competence Scale, 0.91 for the Student Engagement Scale, and 0.82 for the Kulsum Teacher



Effectiveness Scale, indicating high internal consistency. The test–retest reliability coefficients were 0.79, 0.85, and 0.75, respectively, demonstrating satisfactory stability over time.

## XI. DATA ANALYSIS

The collected data were analysed using appropriate statistical techniques to examine the influence of digital pedagogical competence on teacher effectiveness and student engagement among secondary school teachers. Statistical methods such as the t-test were employed to identify significant differences in digital pedagogical competence, teacher effectiveness, and student engagement with respect to demographic variables such as gender and locality. Furthermore, Pearson’s product-moment correlation analysis was used to determine the relationships among digital pedagogical competence, teacher effectiveness, and student engagement. The statistical analyses provided valuable insights into the extent to which digital pedagogical competence contributes to teacher effectiveness and promotes student engagement in secondary school classrooms.

**Objective-1.** To find out the influence of the following variables on the Digital Pedagogical Competence of Secondary School Teachers i.e.

a. Gender : Male/Female

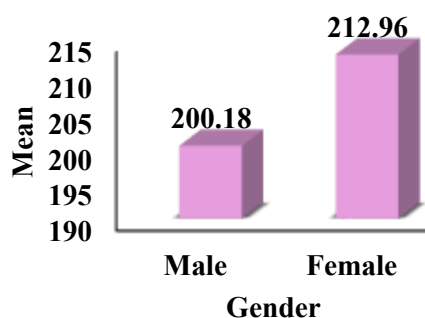
b. Locality: Urban/Rural

**Hypothesis- 1.** There would be no Significance difference between Male and Female Secondary School Teachers Based on their Digital Pedagogical Competence.

**Table 1.** Digital Pedagogical Competence Scores of Male and Female Secondary School Teachers

Gender	N	Mean	Std. Deviation	SEd	t value	p value
Male	70	200.18	12.69	1.86	6.88	$p < 0.00$
Female	80	212.96	9.58			

**Note:** \*Significant at 0.05 level of significance



**Figure 1.** Mean difference between Male and Female Secondary School Teachers Based on their Digital Pedagogical Competence

### Interpretation:

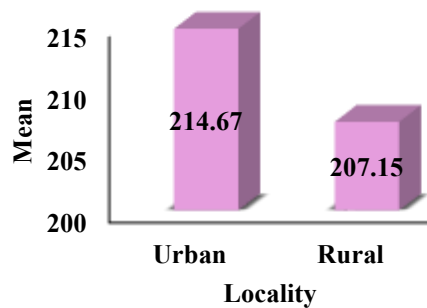
The obtained t-value (6.88) is statistically significant at the 0.001 level. Therefore, the null hypothesis, "There would be no significant difference between male and female secondary school teachers based on their Digital Pedagogical Competence," is rejected. Female secondary school teachers (M = 212.96) demonstrated significantly higher Digital Pedagogical Competence than male secondary school teachers (M = 200.18).

**Hypothesis- 2.** There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Digital Pedagogical Competence.

**Table 2. Digital Pedagogical Competence of Urban and Rural Secondary School Teachers**

Locality	N	Mean	Std. Deviation	SEd	t value	p value
Urban	63	214.67	11.89	1.83	4.11	$p < 0.00$
Rural	87	207.15	9.84			

Note: \* Significant at 0.05 level of significance

**Figure 2. Mean difference between Urban and Rural Secondary School Teachers Based on their Digital Pedagogical Competence****Interpretation:**

An independent-samples t-test was conducted to examine the difference in Digital Pedagogical Competence between urban and rural secondary school teachers. The results indicated a statistically significant difference between urban teachers ( $M = 214.67$ ,  $SD = 11.89$ ) and rural teachers ( $M = 207.15$ ,  $SD = 9.84$ ),  $t(148) = 4.11$ ,  $p < .001$ . Since the obtained p-value was less than .05, the null hypothesis was rejected. The findings suggest that urban secondary school teachers possess significantly higher levels of Digital Pedagogical Competence than their rural counterparts.

**Objective-2.** To find out the influence of the following variables on the Teacher Effectiveness of Secondary School Teachers i.e.

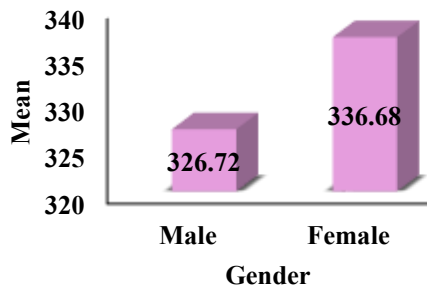
- Gender: Male/Female
- Locality: Urban/Rural

**Hypothesis- 3.** There would be no Significance difference between Male and Female Secondary School Teachers Based on their Teacher Effectiveness.

**Table 3. Teacher Effectiveness of Male and Female Secondary School Teachers**

Gender	N	Mean	Std. Deviation	SEd	t value	p value
Male	70	326.72	10.24	1.65	6.05	$p < 0.00$
Female	80	336.68	9.83			

Note: \* Significant at 0.05 level of significance



**Figure 3 Mean difference between Male and Female Secondary School Teachers Based on their Teacher Effectiveness.**

**Interpretation:**

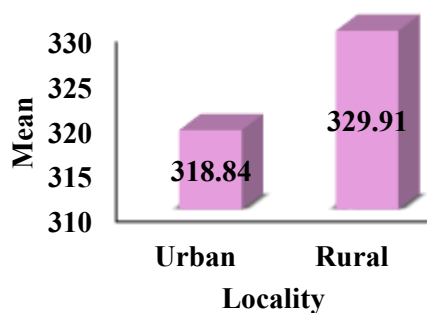
An independent-samples t-test was conducted to examine the difference in Teacher Effectiveness between male and female secondary school teachers. The results revealed a statistically significant difference between male teachers (M = 326.72, SD = 10.24) and female teachers (M = 336.68, SD = 9.83),  $t(148) = 6.05, p < .001$ . Since the obtained p-value was less than .05, the null hypothesis was rejected. The findings indicate that female secondary school teachers demonstrated significantly higher Teacher Effectiveness than male secondary school teachers.

**Hypothesis- 4.** There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Teacher Effectiveness.

**Table 4. Teacher Effectiveness Scores of Urban and Rural Secondary School Teachers**

Locality	N	Mean	Std. Deviation	SEd	t value	p value
Urban	63	318.84	12.64	1.96	5.66	$p < 0.00$
Rural	87	329.91	10.59			

Note: \* Significant at 0.05 level of significance



**Figure 4 Mean difference between Urban and Rural Secondary School Teachers Based on their Teacher Effectiveness.**

**Interpretation**

An independent-samples t-test was conducted to examine the difference in Teacher Effectiveness between urban and rural secondary school teachers. The results revealed a statistically significant difference between urban teachers (M = 318.84, SD = 12.64) and rural teachers (M = 329.91, SD = 10.59),  $t(148) = 5.66, p < .001$ . Since the obtained p-value was less than .05, the null hypothesis was rejected. The findings indicate that rural



secondary school teachers demonstrated significantly higher Teacher Effectiveness than urban secondary school teachers.

**Objective-3.** To find out the influence of the following variables on the Students Engagement of Secondary School Teachers i.e.

a. Gender: Male/Female

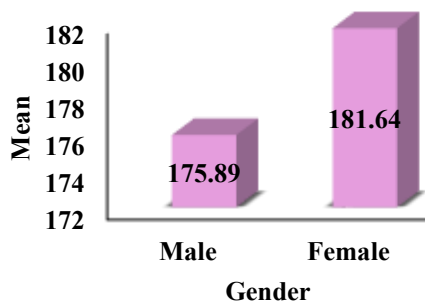
b. Locality: Urban/Rural

**Hypothesis- 3.** There would be no Significance difference between Male and Female Secondary School Teachers Based on their Students Engagement.

**Table 5 Students Engagement of Male and Female Secondary School Teachers**

Gender	N	Mean	Std. Deviation	SEd	t value	p value
Male	70	175.89	9.54	1.40	4.11	$p < 0.00$
Female	80	181.64	7.28			

Note: \* Significant at 0.05 level of significance



**Figure 5 Mean difference between Male and Female Secondary School Teachers Based on their Students Engagement.**

#### Interpretation:

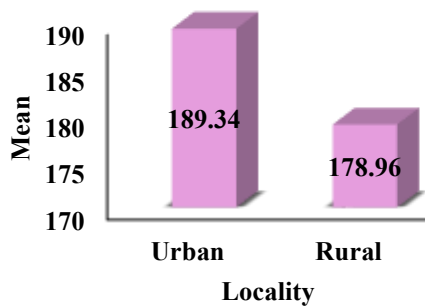
An independent-samples t-test was conducted to examine the difference in Students' Engagement between male and female secondary school teachers. The results revealed a statistically significant difference between male teachers ( $M = 175.89$ ,  $SD = 9.54$ ) and female teachers ( $M = 181.64$ ,  $SD = 7.28$ ),  $t(148) = 4.11$ ,  $p < .001$ . Since the obtained p-value was less than .05, the null hypothesis was rejected. The findings indicate that female secondary school teachers reported significantly higher levels of student engagement than male secondary school teachers.

**Hypothesis- 4.** There would be no Significance difference between Urban and Rural Secondary School Teachers Based on their Students Engagement.

**Table 6. Students Engagement Scores of Urban and Rural Secondary School Teachers**

Locality	N	Mean	Std. Deviation	SEd	t value	p value
Urban	63	189.34	9.56	1.84	5.64	$p < 0.00$
Rural	87	178.96	12.98			

Note: \* Significant at 0.05 level of significance



**Figure 6 Mean difference between Urban and Rural Secondary School Teachers Based on their Students Engagement.**

### Interpretation

An independent-samples t-test was conducted to examine the difference in Students' Engagement between urban and rural secondary school teachers. The results revealed a statistically significant difference between urban teachers ( $M = 189.34$ ,  $SD = 9.56$ ) and rural teachers ( $M = 178.96$ ,  $SD = 12.98$ ),  $t(148) = 5.64$ ,  $p < .001$ . Since the obtained p-value was less than .05, the null hypothesis was rejected. The findings indicate that urban secondary school teachers reported significantly higher levels of student engagement than rural secondary school teachers.

**Objective-4:** To find out the relationship among Digital Pedagogical Competence, Teacher Effectiveness and Students Engagement of Secondary School Teachers.

**Hypothesis-7.** There would be no Significance relationship among Digital Pedagogical Competence, Teacher Effectiveness and Students Engagement of Secondary School Teachers.

**Table 7. Correlation Between Digital Pedagogical Competence, Teacher Effectiveness and Students Engagement of Secondary School Teachers**

		Teacher Effectiveness
<b>Digital Pedagogical Competence</b>	Pearson Correlation	0.872**
	Sig. (2-tailed)	0.000
	N	150
Students Engagement	Pearson Correlation	0.785**
	Sig. (2-tailed)	0.000
	N	150

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### Interpretation

A Pearson product-moment correlation analysis was conducted to examine the relationships among Digital Pedagogical Competence, Teacher Effectiveness, and Student Engagement of secondary school teachers. The results revealed a strong positive and statistically significant relationship between Digital Pedagogical Competence and Teacher Effectiveness,  $r(148) = .872$ ,  $p < .001$ . This indicates that teachers with higher levels of digital pedagogical competence tend to exhibit greater teacher effectiveness.

Similarly, a strong positive and statistically significant relationship was found between Digital Pedagogical Competence and Student Engagement,  $r(148) = .785$ ,  $p < .001$ . This finding suggests that higher levels of digital pedagogical competence among teachers are associated with increased student engagement in the teaching-learning process.



Since both correlation coefficients were positive and statistically significant at the .01 level, the null hypothesis stating that there would be no significant relationship among Digital Pedagogical Competence, Teacher Effectiveness, and Student Engagement of secondary school teachers was rejected. The findings indicate that Digital Pedagogical Competence is strongly associated with both Teacher Effectiveness and Student Engagement among secondary school teachers.

## **XII. MAJOR FINDINGS OF THE STUDY**

1. Female secondary school teachers demonstrated higher levels of Digital Pedagogical Competence than their male counterparts.
2. Urban secondary school teachers possessed greater Digital Pedagogical Competence compared to rural secondary school teachers.
3. Female secondary school teachers exhibited higher Teacher Effectiveness than male secondary school teachers.
4. Rural secondary school teachers demonstrated greater Teacher Effectiveness than urban secondary school teachers.
5. Female secondary school teachers reported higher levels of Student Engagement than male secondary school teachers.
6. Urban secondary school teachers reported higher levels of Student Engagement than rural secondary school teachers.
7. Digital Pedagogical Competence was found to be positively associated with both Teacher Effectiveness and Student Engagement among secondary school teachers.
8. Teachers with higher levels of Digital Pedagogical Competence tended to demonstrate greater effectiveness in teaching and foster higher levels of student engagement.
9. The findings highlight the significant role of digital pedagogical skills in enhancing instructional quality and promoting active student participation in secondary school classrooms.
10. The study underscores the importance of strengthening teachers' digital pedagogical competencies through professional development and technology-integrated training programmes to improve educational outcomes.

## **XIII. DISCUSSION OF FINDINGS**

The findings of the present study revealed significant differences in Digital Pedagogical Competence among secondary school teachers based on gender and locality. Female teachers demonstrated higher levels of digital pedagogical competence than male teachers, while urban teachers exhibited greater digital pedagogical competence than rural teachers. These findings are consistent with the study conducted by Vinay Kumar (2026), who reported significant differences in digital literacy among teachers with respect to gender and locality, with female and urban teachers showing higher levels of digital competence. Similarly, Rabí Isla and Carballo Soca (2025) found that contextual factors such as access to digital resources, work environment, and technological exposure significantly influenced teachers' digital competencies. The findings also support the work of Bala and Kokla (2018), who emphasized that institutional context and technological opportunities play an important role in the development of teachers' techno-pedagogical competence.

The study further revealed significant differences in teacher effectiveness among secondary school teachers. Female teachers were found to be more effective than male teachers, whereas rural teachers demonstrated higher teacher effectiveness than urban teachers. The finding regarding gender is in agreement with the study of S.S. and Vardhini (2017), which reported that female teachers exhibited greater effectiveness in teaching than male teachers. The present findings also support the view that effective teaching is influenced by professional competencies, attitudes, and pedagogical practices. Furthermore, the strong positive association between digital



pedagogical competence and teacher effectiveness aligns with the findings of Tiwari et al. (2025), who identified creativity as a significant predictor of teacher effectiveness, suggesting that professional competencies and innovative practices contribute substantially to effective teaching. Likewise, Vinay Kumar (2026) reported a strong positive relationship between digital literacy and teaching competence, indicating that teachers who possess stronger digital skills tend to demonstrate higher instructional effectiveness.

The findings also indicated that student engagement differed significantly across gender and locality, with female teachers reporting higher levels of student engagement and urban teachers reporting greater student engagement than rural teachers. More importantly, digital pedagogical competence was found to have a strong positive relationship with both teacher effectiveness and student engagement. This suggests that teachers who effectively integrate digital technologies into their instructional practices are better able to engage students and enhance learning experiences. These findings support the contemporary view that digital pedagogical competence is an essential professional competency in technology-rich learning environments. The results are in line with the findings of Vinay Kumar (2026), who emphasized the contribution of digital competencies to effective teaching practices, and with Rabí Isla and Carballo Soca (2025), who highlighted the importance of digital competence in improving educational quality. Overall, the present study confirms that strengthening teachers' digital pedagogical competence can enhance teacher effectiveness and foster higher levels of student engagement in secondary school education.

#### **XIV. EDUCATIONAL IMPLICATIONS**

1. Teachers should be provided with regular training programmes to enhance their digital pedagogical competence.
2. Digital pedagogy should be integrated into pre-service and in-service teacher education programmes.
3. Adequate digital infrastructure and technological resources should be made available in all schools, particularly in rural areas.
4. Teachers should be encouraged to integrate digital tools into classroom instruction to improve teaching effectiveness.
5. Interactive and technology-supported teaching strategies should be adopted to enhance student engagement.
6. Continuous professional development opportunities should be provided to help teachers keep pace with emerging educational technologies.
7. Educational policies should support the effective integration of digital technologies in secondary school education.
8. Teachers should be trained to use digital assessment tools for monitoring student progress and improving learning outcomes.

#### **XV. CONCLUSION**

The present study concludes that Digital Pedagogical Competence plays a significant role in enhancing Teacher Effectiveness and Student Engagement among secondary school teachers. The findings revealed notable differences in digital pedagogical competence, teacher effectiveness, and student engagement with respect to gender and locality. Furthermore, a strong positive relationship was found between digital pedagogical competence and both teacher effectiveness and student engagement, indicating that teachers who effectively integrate digital technologies into their pedagogical practices are more likely to demonstrate higher teaching effectiveness and foster greater student participation in the learning process. In an era of rapid technological advancement, strengthening teachers' digital pedagogical competencies through continuous professional development, technological support, and innovative teaching practices is essential for improving educational quality and creating engaging learning environments in secondary schools.



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