

A Study on Teachers' Practices and Perceptions on the Integration of ICT in the Teaching of Vocational Subjects

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Abstract

This study investigates the integration of Information and Communication Technology (ICT) in vocational education within government secondary schools across various regions of India. Using a mixed-methods approach, data were collected from teachers and students in selected vocational schools. The objectives include assessing ICT facilities' availability, examining teachers' ICT usage, exploring students' engagement with ICT, and identifying challenges faced by teachers. Purposive sampling was employed to select schools, teachers, and students. Findings reveal varying levels of ICT infrastructure availability and usage among schools and participants. Challenges such as inadequate training and resource limitations hinder effective ICT integration. The study provides insights into the current state of ICT integration in vocational education, offering implications for policy and practice to enhance teaching and learning processes. It emphasises the importance of addressing barriers to maximise ICT's potential in vocational education settings.

Keywords: Integration of Information and Communication Technology (ICT); Teaching and Learning; Vocational Subjects; School Education

INTRODUCTION

In response to the evolving educational landscape propelled by technological advancements, the integration of Information and Communication Technology (ICT) in teaching and

learning has become a focal point for educational reform worldwide. The National Education Policy (NEP) of 2020, heralding a transformative vision for India's educational system, underscores the significance of ICT

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in fostering inclusive, flexible, and innovative learning environments. This study explores the integration of ICT, within the realm of vocational education.

REVIEW OF LITERATURE

The integration of ICT in contemporary education has revolutionised traditional teaching and learning paradigms, offering new opportunities for innovation across diverse disciplines. Ishtiningsih (2022) underscores ICT's central role within the Technological Pedagogical Content Knowledge (TPACK) framework, emphasising its potential to empower teachers and enhance student outcomes in vocational education. This view aligns with Banagiri (2021), who notes that globalisation and technological advancement have reshaped work dynamics, necessitating the strategic use of ICT to meet new literacy demands and improve educational quality.

Building on this foundation, several studies have explored ICT's practical application in vocational contexts. Wiranda *et al.* (2020) highlight the importance of ICT tools in teaching methodologies and call for comprehensive support systems to address implementation challenges. Similarly, Ghavifekr and Yulin (2021) examine the barriers to effective e-learning in Malaysia's TVET system, underlining the need for holistic strategies. Saripudin *et al.* (2020) advocate targeted ICT training for vocational educators,

while Kumar and Pandey (2021) emphasise ICT's transformative potential despite infrastructural and pedagogical hurdles.

The importance of robust infrastructure and teacher readiness is echoed in global perspectives. Barfi *et al.* (2020) urge improvements in ICT infrastructure and teacher training in Ghana, a point reinforced by Ennin (2023), who emphasises the need for thoughtful, theory-based integration strategies. Wijayasundara (2020) provides examples of successful international ICT initiatives, identifying infrastructure, training, and English proficiency as critical enablers. Banagiri *et al.* (2021) further examine how globalisation has reshaped modern work and life, reinforcing the urgency of equipping learners with ICT competencies. Supporting this, Pinho *et al.* (2024), Pruñonosa *et al.* (2020), and Abdullah *et al.* (2021) report that, ICT enhances student motivation, engagement, and learning outcomes though recurring issues such as limited infrastructure and insufficient teacher support remain major challenges.

In the Indian context, similar concerns and opportunities are visible. Banagiri, Kumar, and Pandey (2021) observe significant regional disparities in infrastructure and teacher training in vocational education. Pandey *et al.* (2024) demonstrate the benefits of ICT-mediated agricultural education but highlight obstacles such as limited access and lack of localised digital content. Teachers generally

perceive ICT positively for enriching lesson delivery and providing updated resources (Surinder Kaur and Parminder Kaur, 2019). However, implementation is hindered by inadequate training, software limitations, and time constraints (Kumar, S., 2021). Pre-service teachers also report insufficient ICT exposure due to poor connectivity and infrastructure (Nasreen and Chaudhary, 2018). These challenges resonate beyond India, as seen in Sudan's TVET system, where vague policies and weak institutional support obstruct ICT integration (Mishra, 2024). Addressing these barriers requires comprehensive strategies. Studies recommend structured training for both teachers and students, institutional support for hardware and software access, and active stakeholder involvement to ensure effective ICT integration (Swargiary and Roy, 2023; Khan and Markauskaite, 2018). Collectively, the literature underscores ICT's multifaceted role in modern education, advocating for strategic, context-sensitive approaches to maximise its impact in vocational education. Continued research is essential to assess long-term outcomes and refine integration strategies.

RESEARCH OBJECTIVES

- To investigate how often and what types of ICT tools vocational teachers use.
- To assess vocational teachers' confidence and skills in using ICT.

- To explore ICT use in teaching and assessment.
- To identify the benefits ICT in vocational education.
- To understand the challenges faced by vocational teachers in using ICT.

METHODOLOGY

Research Design

This study used a mixed-methods approach with a structured checklist and questionnaire, featuring open-ended and descriptive questions to gather participants' opinions on ICT integration in teaching and learning.

Participants

This study involved vocational teachers from government secondary schools in the Andaman and Nicobar Islands, Puducherry, Madhya Pradesh, Nagaland, Jammu and Kashmir, and Ladakh.

Sample

The study employed purposive sampling to select two states and four union territories. Within each state, two districts were chosen, and within each district, two schools were selected. Each school included two vocational teachers and 20 students from Grades 9 and 11. In total, the study encompassed 12 districts, 24 schools, 48 teachers, and 480 students.

Development of Questionnaire

The questionnaires for vocational teachers, covering ICT utilisation, self-efficacy, teacher support, and

challenges, were meticulously structured, validated by experts, and pilot-tested at Demonstration Multipurpose School, (RIE, Bhopal) to ensure clarity and effectiveness, combining close-ended questions for quantifiable data, and open-ended inquiries for deeper insights.

Data Collection and Analysis

Data were collected using structured checklists and questionnaires administered to vocational teachers in selected government secondary schools. Checklists recorded the availability and use of ICT tools, while questionnaires included Likert-scale, multiple-choice, and open-ended items, to assess ICT usage, confidence, training, support, and perceived benefits and challenges. The instruments were validated through expert review and pilot-tested at Demonstration Multipurpose School (RIE, Bhopal) for clarity and relevance. Data collection was carried out via personal visits, online, or hybrid methods based on regional feasibility. Quantitative data were analysed using descriptive statistics in Excel, while qualitative responses underwent thematic analysis. Triangulation of quantitative and qualitative data enhanced the reliability and depth of the findings.

Validity and Reliability

- (i) *Validity*: The content validity of the tool was confirmed through expert review. A panel of four experts in vocational education, ICT, and curriculum design

evaluated the survey to ensure that it covered all relevant aspects of ICT integration. Their feedback helped to refine the survey to better reflect the goals of the study. Also, the research instruments were pre-tested with a sample of participants.

- (ii) *Reliability*: The reliability of the data collection tool was assessed using Cronbach's alpha to determine internal consistency across different sections of the survey using Statistical Package for the Social Sciences (SPSS) software, and it was found that all sections demonstrate strong internal consistency, with Cronbach's alpha values exceeding the acceptable threshold of 0.7. These results indicate a reliable measure of the constructs assessed in this study.

RESULTS AND DISCUSSION

Using a mixed-methods approach, this study gathered insights on ICT integration in vocational education from teachers and students, employing surveys with diverse tools for quantitative data and open-ended questions for qualitative insights, ensuring comprehensive analysis across segmented results for both groups.

ICT Utilisation by Vocational Teachers

To evaluate the availability and accessibility of different ICT tools in schools across various states and Union Territories, vocational teachers

were provided with a predefined checklist of specific ICT tools. During data analysis, these ICT tools were categorised into distinct themes,

including Generic ICT Tools, Advanced ICT Tools, Vocational-specific Tools, and Miscellaneous. The observed results are presented in Table 1.

Table 1
Utilisation of ICT Tools by Vocational Teachers Across Schools Studied

ICT Tools Types	ICT Tools	MP	Nagaland	J&K	Ladakh	A&N	Pudu-cherry
Generic ICT Tools	Desktop computers	100%	50%	100%	100%	100%	75%
	Printers	100%	75%	100%	100%	75%	33%
	LCD projector	88%	67%	75%	100%	100%	33%
	Laptop	63%	67%	75%	100%	100%	33%
	Tablet	38%	0%	25%	57%	29%	33%
	Cameras	88%	0%	50%	71%	100%	50%
	Speakers	63%	0%	88%	88%	88%	33%
Advanced ICT Facilities	Smart phones	88%	0%	25%	0%	43%	0%
	Interactive/ Smart Board	63%	0%	100%	86%	71%	17%
	Internet access	100%	67%	50%	100%	100%	67%
	Wi-Fi	88%	0%	75%	71%	100%	17%
	Network connectivity	100%	67%	38%	100%	100%	67%
	e-Book reader	13%	0%	50%	57%	43%	17%
	Virtual classroom	25%	0%	50%	71%	86%	67%
	Scanner	63%	0%	50%	71%	71%	67%
	Video-recorder	13%	38%	0%	86%	43%	0%
Vocational Specific	Equipment (sector specific)	25%	33%	25%	71%	43%	0%
	Software Generic	50%	0%	63%	43%	100%	100%
	Software Vocation specific	25%	0%	50%	43%	57%	67%
Miscellaneous	Supporting staff	70%	0 %	80%	63%	57%	100%

Table 1 shows varied ICT tool usage among vocational teachers across Indian states and Union Territories. Basic tools like desktop computers and printers are universally available, with 100 per cent usage in Madhya Pradesh and Andaman and Nicobar Islands, indicating solid infrastructure. Multimedia tools such as LCD projectors and cameras are widely used (88%–100%), supporting visual teaching. Advanced tools like smartphones and interactive boards have high adoption in Madhya Pradesh, Jammu and Kashmir, and Ladakh—for example, 88 per cent smartphone use in MP and 100 per cent interactive smart board use in J&K. However, tools like e-book readers and virtual Classrooms show uneven use. Vocational-specific equipment and software have moderate usage, with Ladakh reporting 71 per cent and A&N 67 per cent, respectively. Support staff availability varies greatly, from 100 per cent in Puducherry to

none in Nagaland, highlighting the need for human resource support. These findings reveal diverse ICT adoption and inform targeted policy development.

Exploring Teachers’ Perceptions of ICT Self-Efficacy

The evaluation of ICT integration in teaching and learning encompassed a crucial aspect: Teachers’ competencies or perceptions of ICT self-efficacy. The study revealed a diverse range of experience levels among vocational teachers in utilising ICT for teaching vocational subjects, with disparities observed both within and across states. While some teachers demonstrated extensive experience and confidence in incorporating ICT tools into their teaching methodologies, others expressed lower levels of confidence. The perceptions of teachers regarding ICT self-efficacy were thoroughly analysed and presented individually and comprehensively in Table 2.

Table 2
Teachers’ Perceptions of ICT Self-Efficacy—A Comprehensive Study

Parameters	Factors				
Level of experience in using ICT for teaching vocational subjects?	Beginner	Intermediate	Advanced		
	11%	60%	29%		
How confident do you feel in integrating ICT tools into your vocational teaching?	Very confident	Somewhat confident	Neutral	Not very confident	
	69%	21.42%	9.52%	0%	

What teaching methods do you use with ICT?	Interactive online modules	Virtual simulations	Online discussions and collaboration	Online portfolios	No Comments
	33%	12%	14.28%	7%	33.33%
Word Processors and Multimedia presentations used	Microsoft Office	Open Office	Google docs	Power Point	Excel
	88.09%	85.71%	90%	90%	86%
Learning Management System (LMS) and Collaboration Tools used	Moodle	Blackboard	Google+	Other specify	No Comments
	24%	40%	12%	14%	10%
Virtual Content platforms used	Zoom	Google Hangouts	WordPress	Blogger	No Comments
	71%	50%	48%	48%	40%

Table 2 highlights vocational teachers' perceptions of ICT self-efficacy and usage in teaching, showing that 60 per cent are intermediate users, 29 per cent advanced, and 11 per cent beginners. Confidence levels are high, with 69 per cent feeling very confident and 21.42 per cent somewhat confident in ICT integration. Interactive online modules (33%) are commonly used, while Microsoft Office tools (85.71% to 90%) dominate for word processing and presentations. Blackboard (40%) and Moodle (24%) are primary LMS choices, and Zoom (71%) is preferred for virtual communication, underscoring a strong reliance on established platforms.

These findings suggests that to enhance ICT integration:

- Prioritise continuous professional development for teachers of all proficiency levels.

- Encourage experimentation with diverse teaching methods and ICT tools.
- Facilitate platforms for educators to share best practices.
- Ensure equal access to robust ICT resources and advocate for supportive policies.
- Establish feedback mechanisms for tailored support.
- Conduct ongoing monitoring and evaluation for continuous improvement in vocational education's relevance and impact in the digital age.

Teachers Perceptions of ICT Self-Efficacy: State-wise Analysis

Level of Experience

The assessment of ICT integration in teaching and learning unveiled

significant disparities in teachers' competencies and perceptions of ICT self-efficacy. Across various regions, a spectrum of experience levels was observed among vocational teachers, highlighting variations both within and across states. While some teachers demonstrated extensive experience and confidence in integrating ICT tools into their teaching practices, others expressed lower levels of confidence. To comprehensively understand these disparities, the data are separately evaluated on each parameter, providing valuable insights for states and union territories seeking to improve ICT competencies based on successful experiences.

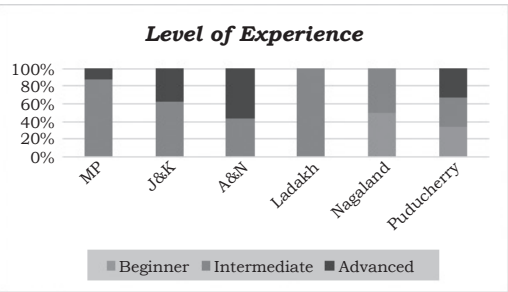


Fig. 1: Level of Experience: State-wise Evaluation

Fig. 1 shows significant variations in vocational teachers' ICT self-efficacy across different regions. In Madhya Pradesh, 87.50 per cent are intermediate users, while Jammu and Kashmir has 37.50 per cent advanced users, indicating varying levels of ICT proficiency. Andaman and Nicobar Islands stand out with 42.85 per cent advanced users, and Ladakh shows 100 per cent advanced, highlighting

high ICT proficiency. Nagaland and Puducherry display balanced distributions, suggesting diverse ICT competency levels. Tailored training is crucial to enhance ICT skills and bridge regional disparities effectively.

Level of Confidence

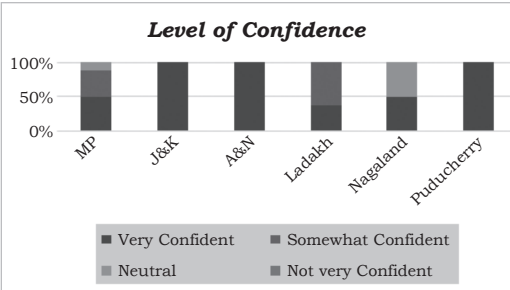


Fig. 2: Level of Confidence: State-wise Evaluation

The data in Fig. 2 represented the vocational teachers' confidence levels in using ICT tools, revealing varying degrees of self-efficacy across states. In Madhya Pradesh, 50 per cent of teachers feel very confident and 37.50 per cent somewhat confident, indicating a positive trend in ICT integration. Conversely, Ladakh shows lower confidence levels (37.50% very confident, 62.50 per cent somewhat confident), highlighting challenges in remote areas. Nagaland's mixed confidence levels underscore the need for support and training, particularly in remoteregions. These observations align with research emphasising the impact of resources, training, and institutional support on ICT adoption readiness (Ertmer, 2005; Teo *et al.*, 2011). Regions like Jammu and Kashmir, Andaman and Nicobar Islands, and Puducherry

demonstrate high confidence levels linked to better infrastructure and training opportunities (Selwyn, 2011; Otieno *et al.*, 2016). Conversely, challenges in remote areas such as Ladakh and Nagaland reflect studies on geographical remoteness and resource constraints (Sharma *et al.*, 2019; Bal *et al.*, 2020). Tailored interventions and support are essential to enhance teachers' self-efficacy in these regions (Das *et al.*, 2020), highlighting the importance of state-level policies and investments in ICT infrastructure and training for equitable readiness nationwide.

Teaching Method

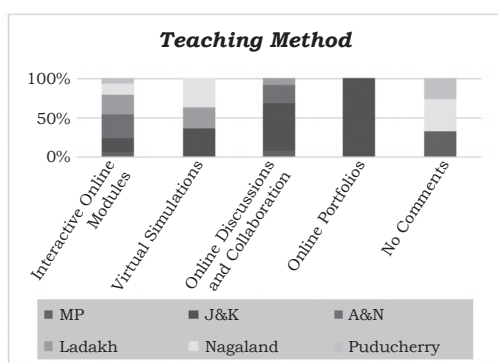


Fig. 3: Fractions of Teaching Methods Used: State-wise Evaluation

Teachers' self-efficacy was assessed through their use of ICT-based teaching methods, which included virtual simulations, interactive modules, online discussions, and portfolios. As shown in Fig. 3, regional variations were evident. In Madhya Pradesh (MP), 25 per cent of teachers used interactive modules, indicating gradual ICT adoption.

Jammu and Kashmir (J&K) reported higher adoption (63%), while usage was highest in the Andaman and Nicobar Islands (100%) and Ladakh (87.5%), reflecting strong proficiency. For virtual simulations, J&K and Nagaland showed the highest adoption (50%), followed by Ladakh (37.5%). Online discussions were common in J&K (88%) and A&N (33%), while Madhya Pradesh and Puducherry showed lower usage. These patterns reflect regional disparities in ICT integration, shaped by infrastructure and training differences (Ertmer, 2005; Teo *et al.*, 2011), highlighting the need for region-specific strategies.

Proficiencies in Microsoft Office Suite

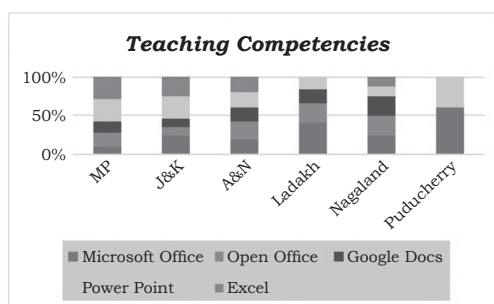


Fig. 4: Teachers' Competencies Level in MS Office Suite: State-wise Evaluation

The data as presented in Fig. 4 on teachers' proficiencies in utilising Microsoft Office Suite, particularly in word processing and multimedia presentations, across various regions. Microsoft Office is extensively used across all regions, with complete adoption in Jammu and Kashmir, Andaman and Nicobar Islands,

and Puducherry, indicating high proficiency. In Madhya Pradesh, 25 per cent usage suggests lower adoption. Open Office is popular in A&N and Nagaland, used by all teachers, possibly due to the cost or accessibility reasons. Google Docs is widely used in all regions except Puducherry, highlighting its preference for collaborative document creation. PowerPoint is prevalent in J&K and A&N, indicating proficiency in multimedia presentations.

Ladakh shows lower adoption, suggesting a need for additional training. Microsoft Office and Open Office are popular, Google Docs is widely used, and PowerPoint shows regional variations, indicating diverse proficiency levels in multimedia tools. Research underscores tailored ICT training in remote areas to enhance teachers' integration and self-efficacy (Abdullah *et al.*, 2019), promoting equitable access and resource utilisation.

Learning Management System

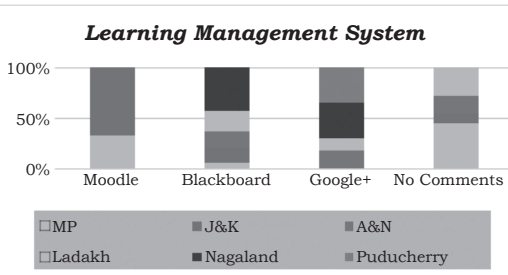


Fig. 5: Extent of Utilisation of Learning Management System

Fig. 5 provides insights into the adoption of Learning Management

Systems (LMS) and collaboration tools among teachers, reflecting varied ICT self-efficacy across regions. Madhya Pradesh shows moderate adoption of Moodle (25%) and Blackboard (12.50%), while Jammu and Kashmir favours Blackboard (37.50%) and Moodle (50%). In Andaman and Nicobar Islands, both Blackboard and Google+ are popular (37.50% each), with no Moodle usage. Ladakh favours Blackboard (50%) and Google+ (37.50%), neglecting Moodle. Nagaland fully adopts Blackboard and extensively uses Google+ (100%). Puducherry shows full adoption of Google+ and Moodle (100%), indicating reliance on these tools. The data underscores heterogeneous adoption rates of LMS and collaboration tools, suggesting varying comfort levels and proficiency across regions. This aligns with research emphasising tailored strategies and support for effective technology integration in education (Shannon *et al.*, 2019; Wang and Wu, 2020).

Virtual Platform

Virtual content platforms like Zoom, Google Hangouts, WordPress, and Blogger play a crucial role in modern education, facilitating interactive learning experiences and transcending geographical boundaries. These platforms allow educators to deliver content, host discussions, and engage students remotely. Fig. 6 provides insights into their adoption among teachers, reflecting varied ICT self-efficacy across regions. In Madhya Pradesh, Zoom is most

popular, followed by Google Hangouts, indicating a preference for real-time communication tools. Jammu and Kashmir shows high adoption of Zoom and Google Hangouts, with moderate use of WordPress for varied content delivery. Andaman and Nicobar Islands display balanced adoption of Google Hangouts, WordPress, and Blogger, showcasing versatility in content creation and dissemination. These findings align with research emphasising the importance of diverse virtual platforms in catering to educators' and learners' needs (HewandCheung, 2014), underscoring the significance of tailored strategies to enhance technology integration and proficiency across regions.

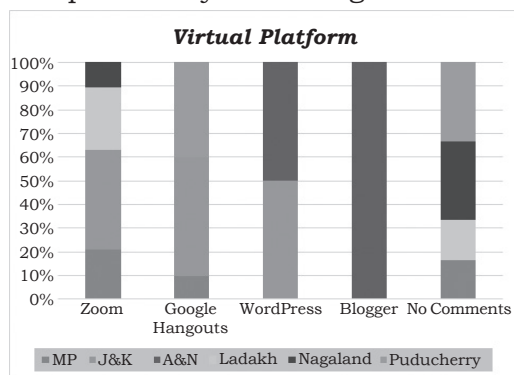


Fig. 6: Virtual Platform Utilisation for Teaching Vocational Education

ICT in Students' Teaching and Assessment

ICT utilisation in teaching and assessment were evaluated under different parameters and are presented under various sub heads in Fig. 7. Data presented in Fig. 7(a) shows diverse utilisation patterns of

ICT tools in vocational subject lessons across regions, with Jammu and Kashmir predominantly reporting occasional usage, while Ladakh demonstrates a balanced distribution between occasional and regular usage. Madhya Pradesh shows occasional incorporation, whereas Puducherry exhibits lower overall rates, highlighting the need for tailored strategies to enhance consistent ICT integration. Fig. 7(b) indicates full utilisation of ICT for practical/lab/training purposes in Madhya Pradesh, Jammu and Kashmir, Andaman and Nicobar Islands, and Ladakh (100% adoption). Conversely, Puducherry shows a lower adoption rate (33.30%), with Nagaland and other regions reporting no utilisation, emphasising regional disparities and the necessity for targeted interventions. Fig. 7(c) reveals widespread use of ICT for student assessment in Jammu and Kashmir, Ladakh, and Nagaland (100% adoption), whereas Puducherry exhibits the lowest adoption rate (33.30%). Madhya Pradesh shows complete adoption, and Andaman and Nicobar Islands report substantial usage (75%), underscoring varied integration levels across regions. Fig. 7(d) demonstrates significant improvements in student learning outcomes through ICT integration, with Madhya Pradesh, Jammu and Kashmir, Andaman and Nicobar Islands, and Ladakh reporting 100 per cent agreement. Nagaland and Puducherry show more varied



Fig. 7: ICT in Students Teaching and Assessment: State-wise Analysis (a) Frequency; (b) ICT in Teaching and Practical; (c) ICT for Assessment; (d) Notable Improvement; (e) ICT Tools in Class; and (f) Educational Forum

responses, indicating positive impacts alongside areas for further exploration.

Fig. 7(e) depicts varying levels of ICT tool usage in Classrooms, with Jammu and Kashmir, Andaman and Nicobar Islands, and Nagaland reporting full adoption rates. Madhya Pradesh and Ladakh show moderate adoption, while Puducherry exhibits the lowest rate, necessitating increased integration efforts across regions. Fig. 7(f) illustrates utilisation levels of educational forums or discussion boards, with Madhya Pradesh showing high usage (87.50%), contrasting with limited adoption in Andaman and Nicobar Islands and Nagaland. Ladakh and Jammu and Kashmir display moderate usage, emphasising the need for diverse engagement strategies tailored to regional contexts.

Perceived Benefits in Utilisation of ICT in Vocational Education

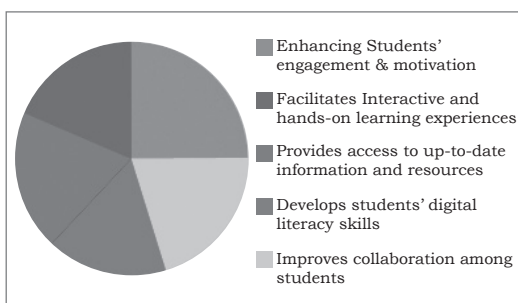


Fig. 8(a): Perceived Benefits of Adopting ICT Tools: Overall Studies

Fig. 8(a) highlights the multifaceted advantages of integrating ICT tools in education. By enhancing student engagement and motivation (67%),

educators were able to create dynamic learning environments that captivate students' interest and encourage active participation. Moreover, facilitating interactive and hands-on learning experiences (54.76%) enables students to explore concepts in a more immersive way, fostering deeper understanding and retention of information. Access to up-to-date information and resources (45.23%) is crucial for keeping curriculum content relevant and aligned with the rapidly evolving landscape of knowledge. This aspect empowers students to stay abreast of current trends and developments in their field of study, enhancing the quality and applicability of their learning experiences. Furthermore, integrating ICT fosters the development of students' digital literacy skills (52%), equipping them with the necessary competencies, to navigate and utilise digital tools effectively in various contexts. This proficiency is increasingly essential in today's digital age, where technological literacy is a prerequisite for success in education and the workplace. Lastly, ICT integration promotes collaboration and communication among students (50%), facilitating peer-to-peer learning, group projects, and collaborative problem-solving activities. These collaborative endeavours not only enhance students' academic outcomes, but also cultivate essential teamwork and communication skills essential for their future careers?

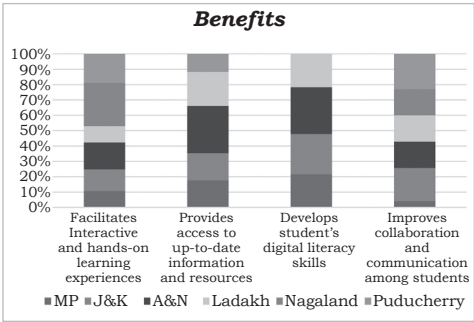


Fig. 8(b): Perceived Benefits of Adopting ICT Tools: Study Across States

Fig. 8(b) illustrates the broad benefits of ICT integration in vocational education across regions, emphasising its role in enhancing teaching and learning. Despite regional differences, common benefits include improved digital literacy, access to updated information, and interactive learning. These findings suggest that ICT tools significantly boost student engagement, knowledge acquisition, and skill development, contributing to a more effective vocational education delivery.

Problems and Solutions

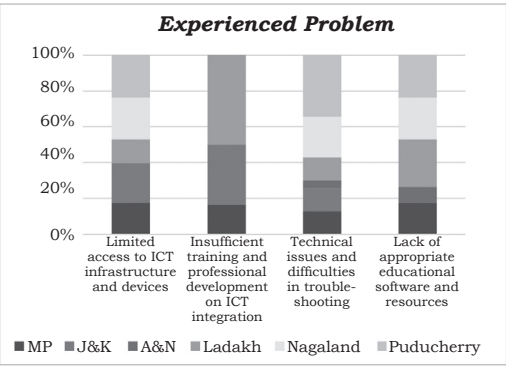


Fig. 9(a): Experienced Problems in Utilisation of ICT Tools

A detailed overview of the challenges faced by vocational teachers and possible solutions is presented in Fig. 9 (a and b). Key issues include limited access to ICT infrastructure and devices, technical difficulties, and lack of suitable educational software and resources. These barriers hinder effective ICT integration, affecting teaching quality and student engagement. To address these challenges, recommended strategies include seeking support from IT or technical staff, participating in ICT training and workshops, and adapting lessons to suit limited ICT access. Additionally, establishing clear guidelines for students' ICT use is essential to manage distractions and foster productive learning environments during ICT-based sessions. In Madhya Pradesh, the most prominent challenge reported is limited access to ICT infrastructure and devices, with 50 per cent of respondents indicating this as a concern. To tackle this issue, seeking support from IT or technical staff (38%) and participating in ICT training and workshops (25%) emerge as potential solutions. These actions can help educators navigate technical challenges and enhance their proficiency in utilising available resources effectively.

Similarly, in Jammu and Kashmir, inadequate training and professional development on ICT integration (25%) pose a significant challenge. To overcome this obstacle, participating in ICT training and workshops (38%) is suggested, offering

teachers opportunities to enhance their ICT skills and knowledge. Additionally, setting clear guidelines and expectations for students' ICT use (25%) can help manage classroom distractions and improve the learning experience.

In Ladakh and Nagaland, technical issues and difficulties in troubleshooting (37.50% and 67% respectively) emerge as major challenges. Participating in ICT training and workshops (38% and 25% respectively) can provide teachers the necessary skills to address technical issues effectively. Additionally, adapting lessons to accommodate limited access to ICT resources (37.50% and 33.33% respectively) can help ensure equitable learning opportunities for all the students. Furthermore, in Puducherry, where the lack of appropriate educational software and resources (33.33%) is a notable challenge, participating in ICT training and workshops, (67%) can aid teachers in discovering and utilising suitable digital tools. Setting clear guidelines and expectations for students' ICT use (66.66%) can also contribute to managing distractions and fostering a conducive learning environment.

Overall, addressing the identified challenges through targeted solutions tailored to the specific needs of each state, can help vocational teachers overcome obstacles and effectively integrate ICT into their teaching practices, ultimately enhancing the quality of education delivery.

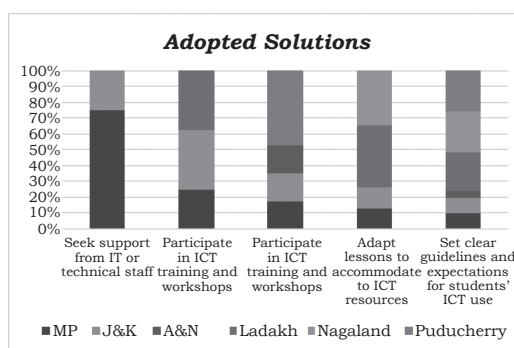


Fig. 9(b): Adopted Solutions for the Encountered Challenges in Utilisation of ICT

Government Assistance to School Teachers for ICT Learning Across States

The rating of institution support or assistance from government to teachers in providing facilities, reflects a mixed perception among educators. While a significant portion rates it as good or excellent (76%), a notable 23 per cent perceive it as fair or poor as illustrated in Table 3. This suggests that while some institutions may provide adequate support, there are still areas available for improvement, particularly in ensuring equitable access to resources and assistance. Government assistance and resources play a crucial role in bridging these gaps by providing funding, training programmes, and infrastructure upgrades to schools. However, the disparity in ratings indicates that more comprehensive and targeted support measures may be necessary to address the varying needs of educators and schools. By investing in robust support systems, governments can empower

teachers with the tools and knowledge needed to effectively integrate ICT into vocational education, ultimately enhancing the quality of learning experiences for students.

Status of Formal Training Provided to Teachers

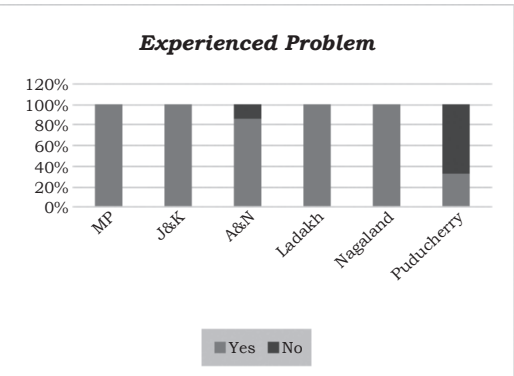


Fig. 10: Status of Formal Training provided from Govt to VTs

Fig. 10 shows that most teachers across regions have received formal ICT training, with rates between 85.71 per cent and 100 per cent in areas like Madhya Pradesh, Jammu and Kashmir, and Ladakh, reflecting strong institutional support. However, Puducherry reports a low

rate (33.30%), indicating regional disparities in training access. These findings highlight the importance of equitable training opportunities to ensure effective ICT integration and improved teaching quality.

Suggestions and Demands for Improving Vocational Teachers with the Assistance of ICT

To optimise ICT integration in vocational education, key initiatives include:

- Increasing computers and installing projectors and smart devices in labs for hands-on learning.
- Providing regular ICT training for teachers to improve classroom management and motivation.
- Equipping labs with diverse resources to support varied teaching methods; maintaining software updates and expanding computer availability.
- Ensuring campus-wide Wi-Fi for access to digital tools.

These steps aim to strengthen infrastructure and equip educators

Table 3
State-wise Government Assistance/Resources Provided to School Teachers for ICT Learning

Response	MP	J&K	A&N	LADAKH	NAGALAND	PUDUCHERRY
Excellent	0%	37.50%	37.50%	25%	0%	0%
Good	100%	62.50%	57.14%	38%	0%	66.60%
Fair	0%	0%	0%	37.50%	100%	33.30%
Poor	0%	0%	0%	0%	0%	0%

and students with essential digital skills.

Implications of the Study for Vocational Education

The study's implications for vocational education are profound, offering insights into ICT integration's benefits, challenges, and teacher perceptions. It underscores the need for policies addressing technology access, teacher training, and assessment practices. These findings advocate for tailored teacher development programmes to optimise ICT utilisation. Moreover, they pave the way for future research, ensuring ongoing improvement in vocational education's quality amidst technological advancements. Overall, the study highlights ICT's transformative potential, urging stakeholders to embrace its integration to enrich vocational learning experiences and prepare students for the demands of the modern workforce.

CONCLUSION

While the integration of ICT in vocational education presents significant opportunities for enhancing learning experiences and vocational skills, challenges such as resource limitations and insufficient training persist. Despite these obstacles, the study underscores the positive impact of ICT on student engagement and skill development. Moving forward, concerted efforts from policymakers and educational institutions

are imperative to address these challenges, ensuring equitable access to resources and comprehensive training for teachers. By doing so, vocational education can better equip students with the necessary skills for success in the technology-driven workplace of the twenty first century.

Recommendations

Recommendations for integrating ICT in vocational education include teacher professional development, infrastructure investment, promotion of collaborative learning, ensuring student access to digital tools, implementing blended learning approaches, integrating industry-relevant technology, and regular evaluation. These measures aim to enhance student learning experiences and prepare them for the modern workplace. Policymakers and educational institutions must prioritise these recommendations to equip students with essential skills for success, in an increasingly technology-driven world.

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