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Topic of Research: A Study of ICT-Integrated Science Teaching-Learning at Secondary School Stage in Aspirational Districts

Keywords: ICT, Science Teaching, Science Learning, Science Education, Aspirational Districts

Findings

The study aimed to determine the status of Information and Communication Technology (ICT), the extent of its integration in the teaching and learning of science and the challenges/problems faced by science teachers and students in government schools of Aspirational Districts. To conduct the research, descriptive research was employed to understand ICT integration in science education. The researcher addressed objectives using quantitative and qualitative data collected from 30 science-trained graduate teachers and 600 Class IX students of government secondary schools in two Aspirational Districts—Haridwar (Uttarakhand) and Moga (Punjab). Data were gathered through a checklist, interview schedule, focus group discussion, and classroom observation schedule, and were analysed both quantitatively and qualitatively. Findings of the study are

- **Availability and Functionality of ICT Infrastructure**
 - Most schools are equipped with computer laboratories, and some have smart classrooms, but multimedia rooms and digital libraries are absent.
 - Basic input, output, storage devices and ICT-supportive furniture are widely available and largely functional.
 - Schools have wired and wireless internet, though advanced networking facilities are limited.
 - Essential software such as Windows OS and Microsoft Office is universally available, while advanced tools like AR/VR and interactive multimedia are missing.
 - Electricity and backup systems are generally available; however, newer digital devices like tablets and laptops are limited.
- **Usability of ICT for Science Teaching–Learning**
 - Both teachers and students acknowledge that ICT tools (videos, simulations) improve conceptual understanding.
 - Teachers mainly depend on mobile phones and government platforms but lack formal ICT training.

- Students have partial awareness of selected educational apps but no exposure to advanced simulation tools.
- ICT use in classrooms is occasional, and many students lack personal digital devices.
- There is strong demand for science multimedia content in local languages.
- **Extent of ICT Integration in Science Teaching**
 - More than half of teachers show readiness for ICT-integrated teaching.
 - Desktop computers and projectors are the most used ICT tools; advanced devices are rarely used.
 - Only a moderate proportion of teachers meaningfully integrate ICT into classroom pedagogy.
 - Teacher interaction, communication, and pedagogical use of ICT remain limited.
- **Challenges in ICT Integration**
 - The major barrier is the lack of structured ICT training for teachers.
 - Poor internet connectivity frequently disrupts ICT-based teaching.
 - Teachers lack skills to develop their own multimedia and e-content.
 - Limited ICT devices in regular classrooms and time loss in visiting computer labs hinder effective use.
 - Language mismatch between available digital content and learners' local language affects comprehension.
 - Students' limited access to personal devices and suboptimal lab conditions restricts ICT use.
 - Existing video programmes often lack local relevance and sometimes have quality issues.

The study concluded that selected government secondary schools in Aspirational Districts are equipped with functional ICT infrastructure, including computer labs, desktops, projectors, storage devices, and power backup, though smart classrooms, interactive boards, seminar rooms, and STEM labs remain limited. Teachers widely use DIKSHA, NCERT resources, Punjab Educare, and OLabs for science teaching, but many lack training in ICT-integrated pedagogy and advanced tools such as simulations, augmented reality, and specialized software. Students often face restricted access to devices, inadequate exposure to ICT-based practicals, and limited awareness of digital resources. Poor connectivity, insufficient localized content, and the lack of systematic ICT integration remain major challenges.