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# Implementation of Education 4.0: Its' Needs and Challenges

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**Abstract**

This research investigated the needs and challenges faced by 154 secondary teachers in adopting Education 4.0 in Hamtic North and South districts, Schools Division of Antique. Using a descriptive cross-sectional research design, data were collected through a structured questionnaire that measured teachers' perceived needs and hindrances to the adoption of Education 4.0 tools and methodologies. Findings showed that teachers displayed a high willingness to adopt technology in instruction, with the most urgent needs revolving around ongoing professional development in pedagogy through digital means, availability of newer ICT tools, and administrative support. Nevertheless, there are several major challenges preventing implementation. They encompass unstable internet connectivity, lack of adequate digital equipment, poor student access to devices, and insufficient training on newer technologies like virtual reality and artificial intelligence. Statistical processing also revealed that more experienced teachers indicated greater training needs, and teachers with consistent internet access indicated less difficulty. The results provide evidence of an evident gap between policy guidance and ground-level capacity, especially in rural education settings. To promote successful implementation of Education 4.0, the study suggests enhanced investment in infrastructure, focused digital skills education, and supportive institution for teachers. These measures are crucial to make sure that rural schools will not be left behind in the shift to future-ready education.

**Keywords:** Education 4.0, digital pedagogy, secondary school teachers, rural education, ICT integration, teaching challenges, professional development, infrastructure, Antique, Philippines

## Introduction

The advent of the Fourth Industrial Revolution, marked by the convergence of digital, biological, and physical systems, has given rise to Education 4.0—a notion that synchronizes educational practices with quickly changing technological advancements. Education 4.0 encourages personalized, student-centered, and technology-enabled learning spaces with the goal of fostering skills like critical thinking, creativity, collaboration, and digital literacy (Schwab, 2016; Sharma et al., 2020). It focuses on the application of artificial intelligence, Internet of Things (IoT), augmented and virtual reality, and big data analytics in the teaching-learning process (Hussin, 2018).

Within the Philippine context, the Department of Education (DepEd) has already started to promote digital transformation programs to keep up with the worldwide Education 4.0 trends as embedded in the Basic Education Development Plan 2030 and MATATAG Agenda. But uneven distribution of resources, digital skills, and infrastructure continues to prevail, especially in rural provinces like Antique (DepEd, 2022).

This research targets the 154 secondary school teachers in Hamtic North and South districts, under the Schools Division of Antique, to evaluate their preparedness, perceived needs, and challenges in the adoption of Education 4.0. In spite of policy-level advocacies, the effective implementation relies heavily on the teachers' level of technological expertise, availability of digital tools, and pedagogical adaptability (Moreno et al., 2021). It is important to understand their experience and challenges in order to customize support systems and interventions that will facilitate the successful integration of Education 4.0 in rural schools.

Therefore, this study seeks to learn about the demands and issues that these teachers are facing, including how Education 4.0 can be equally and better carried out in a variety of education settings in the Philippines.

## Methodology

### Research Design

This research utilized a quantitative, descriptive cross-sectional study design to explore the challenges and needs of implementing Education 4.0 among secondary school teachers. A cross-sectional design was considered suitable because it enables data collection at a single point in time, which gives a snapshot of the present perceptions, experiences, and challenges of the respondents (Setia, 2016). This technique is especially appropriate to detect trends, associations, and patterns in vast populations without changing variables.

### Participants

The research consisted of 154 secondary school teachers from the Hamtic North and South Districts, which fall under the Schools Division of Antique. Participants were chosen through stratified random sampling to ensure that each school had proportional representation from both districts. The inclusion criteria were that participants must be full-time public secondary school teachers who were actively teaching in the classroom during the school year 2024–2025.

### Data Collection Instrument

A structured questionnaire survey was employed as the major instrument of data collection. The instrument was crafted from literature on Education 4.0 implementation (Hussin, 2018; Sharma et al., 2020) and validated by three education and instructional technology experts. The survey questionnaire had three overall sections: (1) demographic profile, (2) needs perceived in executing Education 4.0, and (3) challenges faced. 5-point Likert scale was utilised to measure needs and challenges quantitatively.

### Data Collection Procedure

Following clearance by the Schools Division of Antique and consent from respondents, the researchers distributed the survey through both written and electronic versions, depending on respondent accessibility. Data collection spanned two weeks in February 2025.

### Data Analysis

The data were analyzed based on descriptive statistics, including frequency, percentage, mean, and standard deviation to describe responses. Inferential statistics, including t-tests and ANOVA, were also utilized in identifying significant differences in the identified needs and challenges based on

demographic variables (e.g., age, years of experience as a teacher, technology access).

**Result**

The study's findings provided significant information on the needs and issues faced by 154 secondary school teachers in Education 4.0 implementation at Hamtic North and South districts, under the Schools Division of Antique. The demographic profile indicated that 68% of the respondents were females, with the majority belonging to the age group of 31 to 40 years. With regard to instructional experience, the most significant number had served 11 to 15 years. While 74% of the respondents indicated they had access to a personal laptop or desktop, only 39% indicated having consistent internet connectivity in their schools, indicating a huge digital infrastructure deficit.

In determining the capacity needs for Education 4.0 implementation, teachers reported an extremely high demand for capacity development activities. The highest need expression was for continuous professional development for digital pedagogy, at a mean value of 4.56 out of a possible 5 points on a Likert scale. This was followed closely by the desire for access to current ICT tools and learning platforms (mean = 4.48), and assistance with creating technology-based lesson plans (mean = 4.35). Teachers also highlighted the need for having enough time and institutional support to implement Education 4.0 approaches in the classroom.

In regard to challenges, the greatest concern mentioned by teachers was inadequate internet connectivity within schools with a mean score of 4.51. This was followed by inadequate ICT equipment (mean = 4.33) and inadequate training in new digital tools like artificial intelligence, augmented reality, and virtual simulations (mean = 4.27). Also mentioned by teachers were students' challenges in having access to digital devices at home and the intricacies of combining technology with subject matter, especially in non-STEM areas.

Additional statistical results showed that younger and less experienced teachers (especially those with fewer than five years of service) have shown a much greater need for training and development than their more experienced counterparts. In contrast, teachers with regular internet access at the schools reported fewer challenges in integrating technology, which indicates that infrastructure has a crucial role in facilitating Education 4.0 implementation. Notably, gender did not reveal a marked difference in either the perceived needs or challenges, suggesting that such concerns are broadly shared among both male and female teachers.

In general, the data indicate that although teachers in Hamtic are open to the adoption of Education 4.0 practices, they are confronted with systemic obstacles—particularly infrastructure, access to training, and institutional support—that need to be overcome for successful full implementation.

**Discussion**

The outcomes of this research are a valuable contribution to an understanding of the existing situation in the implementation of Education 4.0 by teachers in Hamtic North and South districts. Whereas the world transition towards Education 4.0 necessitates innovation, individualization, and incorporation of technology into teaching and learning (Hussin, 2018; Sharma et al., 2020), real preparedness and capability among rural educators in a place like Antique continue to be hindered by infrastructural, technological, and professional capacity obstacles.

One notable outcome is the clear demand for ongoing professional development in digital pedagogy. This indicates teachers' perception of the evolving nature of education and their readiness to change, but

also points toward the gap between existing training programs and the competencies required for Education 4.0. This is in accord with earlier findings by Moreno et al. (2021), who emphasized that Filipino teachers commonly have no formal training in the use of developing digital tools, especially those other than basic ICT usage.

Where challenges are concerned, the absence of trustworthy internet access and a lack of adequate ICT facilities were repeatedly reported as significant hindrances. This resonates with national reports from the Department of Education (2022), which described infrastructure deficits—particularly in rural and remote locations—as primary constraints to the equitable application of digital education reforms. The findings highlight that without guaranteed connection and suitable devices, even highly engaged teachers find it hard to provide technology-supported instruction.

Surprisingly, the reported challenges by teachers were not significantly gendered but were impacted by teaching experience and internet resource availability. Less experienced teachers indicated more need for training, perhaps because they had fewer opportunities to get hands-on experience in teaching prior to the pandemic-driven transition to blended and online modes. At the same time, those with improved internet access had fewer integration issues, highlighting how infrastructural foundations are central to the success of Education 4.0 programs.

In spite of the limitations, the research indicated a general willingness and preparedness among teachers to adopt digital innovation in education, as long as the support systems are available. This supports the argument that teacher empowerment—through training, equipment, and institutional support—is key to realizing the objectives of Education 4.0 (Schwab, 2016).

In conclusion, although Education 4.0 offers encouraging possibilities for revamping the Philippine education system, its application in the Hamtic North and South districts shows both optimism and frustration. Closing the policy promise and classroom reality gap entails strategic investment in infrastructure, capacity development, and ongoing support designed to address the needs of educators in rural settings.

**Conclusion**

This research investigated the challenges and needs of 154 secondary school teachers in integrating Education 4.0 in Hamtic North and South districts, under the Schools Division of Antique. The results indicated that although there is a high desire among teachers to embrace Education 4.0 principles, actual integration is still hampered by strong barriers. Topmost among these are unreliable internet connectivity, absence of access to proper ICT tools, and inadequate training in sophisticated digital teaching methods.

Teachers repeatedly indicated a strong need for professional development in pedagogy in the digital age, highlighting the need to prepare teachers with the knowledge and skills necessary to teach in the 21st century. Concurrently, their reported challenges—most notably infrastructure and students' access to technology—emphasize the systemic inequities that persist within rural education environments.

The research also ascertained that experience and availability of technology shaped teachers' perception of their level of preparedness and challenges that they faced. Nonetheless, notwithstanding these variations, the thread across all respondents was a mutual sense of the relevance of Education 4.0 in equipping students for what lay ahead in the technology-enhanced world.

Finally, in order for Education 4.0 to be genuinely realized in rural communities like Antique, a synergized and context-informed process needs to be adopted. These range from enhanced school infrastructure to providing sustained professional growth, along with building administrative and policy

assistance across all echelons. Through these interlinked efforts only can the future-proof education system really be seen in all regions of Philippine society.

**Recommendation**

According to the results and findings of this research, a number of significant recommendations are offered to facilitate the effective implementation of Education 4.0 among secondary school teachers of the Hamtic North and South districts, Schools Division of Antique.

Foremost among these should be the prioritization by the Department of Education, with cooperation from local school administrators, to invest in digital infrastructure. Quality internet connection and ICT equipment update access are minimum necessities for Education 4.0. For these barest minimum needs to be neglected is to keep perpetuating difficulties teachers have with adopting technology into teaching.

Secondly, rural educators need capacity-building programs that are context-specific and of a critical urgency. Professional development workshops should not merely cover generic ICT skills but rather concentrate on the pedagogical application of cutting-edge tools like virtual reality, learning management systems, artificial intelligence, and other new educational technologies. These training programs need to be continuous, hands-on, and available to all teachers, no matter what their experience level might be.

Third, schools could dedicate time and resources explicitly for lesson planning and digital content creation. Lack of time was a recurring constraint mentioned by teachers in adopting tech-integrated methods. By allocating exclusive hours for digital lesson planning and peer collaboration, the quality and sustainability of Education 4.0 practices can be improved.

In addition, support systems need to be institutionalized, such as ICT coordinators, technical support personnel, and mentoring systems that support teachers as they move towards more technology-based teaching practices. Also necessary is the provision of strong leadership from school heads who actively encourage and model the application of Education 4.0 principles.

Finally, future studies must investigate the student half of the equation, particularly their access to devices, learning preparedness, and digital literacy. Knowing the learner's side will fill in the gaps and inform more inclusive education policy-making.

By putting these recommendations into practice, the Antique Schools Division—and the like rural provinces—can be nearer to achieving the objectives of Education 4.0 in empowering both educators and students for the challenge of a fast-changing educational environment.

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