

Challenges and Adaptations in Remote Math Teaching: Insights from Rural Educators in Indonesia

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Abstract

This research focused on the experiences of rural math educators in Indonesia during the pandemic period. The study investigated the challenges encountered by math teachers with varying levels of experience in remote instruction, spanning from beginners to veterans with over 15 years of teaching experience through surveys and interviews. The study utilized a mixed-methods approach which involves combining qualitative and quantitative research methods to achieve a more comprehensive understanding of the challenges encountered by math teachers in remote settings. The findings highlighted common challenges such as poor internet connectivity, limited student access to devices, and decreased student engagement in remote lessons. Despite these challenges, rural math educators have implemented innovative strategies, utilizing diverse online platforms to enhance student participation. Additionally, this study discovered the impact of remote teaching on educators' professional growth as they adapt to new technologies and teaching methods. As schools have transitioned back to in-person learning, the insights underscored the importance of addressing digital disparities and providing educators with the necessary support to navigate future disruptions in the educational landscape.

Kata kunci: remote math teaching, rural educators, teaching methods

INTRODUCTION

The COVID-19 pandemic brought an educational crisis. It forced schools worldwide to adopt remote learning models. This shift impacted educators, particularly those in rural settings. Research conducted before the pandemic identified challenges faced by rural educators. Van Nuland et al. (2020) found limited access to technology, professional development opportunities, and support structures in their study of rural school educators. Goudeau et al. (2021) looked at how socioeconomic disparities affect rural education, showing how they limit student access to technology and resources, widening the achievement gap. These existing problems became worse when schools shifted to remote learning during the pandemic. UNICEF's (2021) report emphasized how the shift to remote learning disproportionately affected marginalized communities, including rural areas. The unequal situation in education is evident in different areas emphasized by the COVID-19 pandemic's effect on remote learning. These include restricted availability of technology and resources, insufficient chances for professional growth, and economic inequalities. These issues, intensified by the move to remote learning, have a disproportionate impact on rural teachers, leading to an increased achievement gap and worsening existing inequalities in education. Similarly, Tuul et al. (2022) studied rural schools in Austria, Estonia, Finland and Romania during the pandemic, highlighting challenges like internet connectivity, device access, and teacher preparedness for remote teaching.

Extensive research has examined the overall impact of the pandemic on education. However there is more to learn about what happened in rural areas in Indonesia during the pandemic. Several studies in rural settings in Indonesia have focused on the learning challenges during pandemic (Indrawati et al., 2021; Kusuma, 2022; Surahman et al., 2021). The transition to online learning posed significant hurdles for math teachers in Indonesia and all around the world. Notably, the lack of reliable internet access and limited availability of technological devices made it difficult for both teachers and students to engage effectively in remote education (Almanthari et al., 2020; Barlovits et al., 2021). Additionally, math teachers faced challenges in delivering complex mathematical concepts through virtual platforms, which often do not lend themselves well to dynamic, interactive problem-solving sessions that are essential for understanding mathematical principles (Ní Fhloinn & Fitzmaurice, 2021; Rahayu et al., 2022). Moreover, the pandemic highlighted and exacerbated pre-existing educational inequities, with students in rural areas being particularly disadvantaged. Math teachers had to navigate these disparities, attempting to provide equitable learning opportunities despite the wide variance in access to educational resources (Julie et al., 2022; Yılmaz, 2021). Teachers also reported feeling unprepared for the sudden shift to online teaching, citing a lack of training and support in using digital tools effectively for instruction (Irfan et al., 2020; Saadati, 2021).

Despite these challenges, some studies have highlighted innovative approaches adopted by math teachers to overcome these obstacles. This includes the use of social media platforms to engage students, the creation of low-tech educational resources for students without internet access, and the formation of small, local study groups to facilitate learning (Haryani & Hamidah, 2022; Imron et al., 2022; Rianasari et al., 2021). This additional research will complement existing studies and provide a more comprehensive understanding of the challenges faced by math educators in these areas. The study will deepen on the particular challenges they faced, the innovative strategies they used, and the lasting impact on their professional growth and future teaching practices. Addressing this part is crucial because rural educators often play a vital role in providing educational access and equity in under-resourced communities (Darling-Hammond, 2022).

Using surveys and interviews, the study aimed to deepen understanding of rural math educators' experiences during the pandemic. By analyzing their challenges, strategies, and professional growth, the research focused to offer valuable insights for policymakers, educators, and communities striving to build a more resilient and equitable education system, particularly in underserved rural settings. Focusing on Desa Pangururan, the study serves as a microcosm, drawing lessons from one community that can shed light on the broader experiences of rural educators globally. This study explores the experiences of rural educators in Desa Pangururan, Indonesia, during the pandemic period.

The Diversity of Rural Education

It is crucial to recognize that rural education is not the same everywhere. Different regions face unique challenges, and understanding these differences is essential. For instance, studies by Pressley & Ha (2021) in the United States and Page et al. (2021) in Australia shed light on the distinct struggles experienced by rural educators in these countries. In the U.S., factors such as geographic isolation, limited access to resources, and disparities in funding pose significant challenges for rural schools and teachers. Meanwhile, in Australia, issues like remote location, sparse population density, and inadequate infrastructure present their own set of hurdles for educators.

Similarly, research conducted by Padmanabhanunni & Pretorius (2021) in South Africa explored the impact of teacher isolation and the limitations of professional networks, which were exacerbated during the pandemic. South African rural educators often grapple with isolation due to their remote locations and lack of access to support networks and professional development opportunities. The pandemic further exacerbated these challenges, highlighting the need for targeted support and resources to address the unique needs of rural teachers in South Africa.

In India, Naik et al. (2020) examined how remote learning impacted rural schools, emphasizing the critical role of community support in overcoming resource limitations. With limited access to technology and internet connectivity, rural schools in India faced significant hurdles in transitioning to remote learning during the pandemic. However, the strong sense of community and support networks

played a crucial role in mitigating these challenges, highlighting the importance of community involvement in ensuring educational continuity in rural areas.

Overall, these studies underscore the importance of understanding the diverse contexts and experiences within rural education (Campbell-Halfaker & Gregor, 2021). By recognizing and addressing the unique challenges faced by rural educators in different regions, policymakers, educators, and communities can develop tailored interventions and support systems to improve educational outcomes for rural students. Stenman and Pettersson (2020) explored the potential of remote teaching to address educational challenges in rural areas, focusing on equality and inclusion. They found that remote teaching could offer new learning opportunities by expanding the learning environment and providing equal access to qualified teachers. However, this requires redesigning the learning context with flexibility to meet individual students' needs, highlighting the increasing importance of teachers' pedagogical digital competence (PDC) and digital relational competencies. Additionally, fostering collaboration and knowledge-sharing among researchers and teachers can further enrich our understanding of rural education and inform more effective strategies for addressing its challenges.

Thus, the research aims to describe the experiences of rural math educators in Indonesia during the pandemic period. This enriched understanding can then inform targeted interventions and support systems that address the specific needs and challenges of these educators, ultimately contributing to a more equitable and resilient education system for all, particularly in rural communities worldwide.

METHOD

This study employs a mixed-methods approach, utilizing surveys and semi-structured interviews to investigate the experiences of rural math educators in Desa Pangururan amidst the challenges posed by the COVID-19 pandemic. The choice of a mixed-methods design allows for a comprehensive exploration of the realities faced by educators, combining quantitative data from surveys with qualitative insights gleaned from interviews.

The surveys targeted specific variables including the demographics of educators, their teaching experience, and the level of technological resources available to them. To evaluate attitudes towards technology use and access in education, a scale from 1 (Strongly Disagree) to 5 (Strongly Agree) has been used. The quantitative data aimed to reveal patterns and correlations, offering insights into the educational landscape of Desa Pangururan, North Sumatera. Semi-structured interviews further explored educators' experiences, perceptions, and tactics in navigating educational challenges. This qualitative method allowed for an in-depth examination beyond the numerical data, capturing the complexities of rural education.

Convenience sampling was chosen as the sampling method to select participants, considering the limited population size of Desa Pangururan. This approach facilitated access to a diverse range of educators, ensuring representation across different levels of experience, educational roles, and backgrounds. While convenience sampling may pose limitations in generalizability, it allowed researchers to capture perspectives and experiences within the context of rural education in Desa Pangururan.

Drawing upon established research methodologies, this study seeks to contribute to the existing body of knowledge on rural education, particularly in the context of remote math teaching during the COVID-19 pandemic. By adopting a mixed-methods approach and integrating quantitative and qualitative data, the research aimed to offer an understanding of the challenges and opportunities faced by rural math educators in Desa Pangururan. Through data analysis and interpretation, the study endeavors to generate insights that can inform policy decisions, educational practices, and support mechanisms aimed at enhancing the resilience and effectiveness of rural education systems.

RESULT AND DISCUSSION

During the COVID-19 pandemic, educators in Desa Pangururan, a rural village in North Sumatra, Indonesia, ranging from 0 to over 15 years of teaching experience, transitioned to remote teaching. The survey conducted among 20 math teachers, all of whom were navigating remote teaching for the first time, revealed a varied range of teaching experiences. The breakdown is as follows: one teacher

has 15 years of experience, seven teachers fall within the 5-10 years experience bracket, another seven have 3-5 years of experience, and the remaining five have been teaching for less than three years. Using software platforms such as Zoom, Google Meet, Google Classroom, Google Forms, Whatsapp Group, and Quizizz, educators conducted remote lessons. However, despite the availability of these tools, math educators expressed concerns about the effectiveness of remote teaching compared to traditional classroom instruction. In some interviews, the teachers explained that electronic constraints, including network disruptions experienced by students and limited access to data packages or smartphones, hindered remote participation for some. Additionally, educators perceived student engagement during remote sessions to be lacking, further complicating the teaching process (Indrawati et al., 2021; Kusuma, 2022; Surahman et al., 2021).

To address these challenges, educators implemented strategies such as creating WhatsApp groups for distributing materials and tasks, advising students with limited home network access to use alternative venues like schools or village offices, and initiating blended learning approaches. Nonetheless, there was a restriction on the number of students able to participate in in-person sessions.

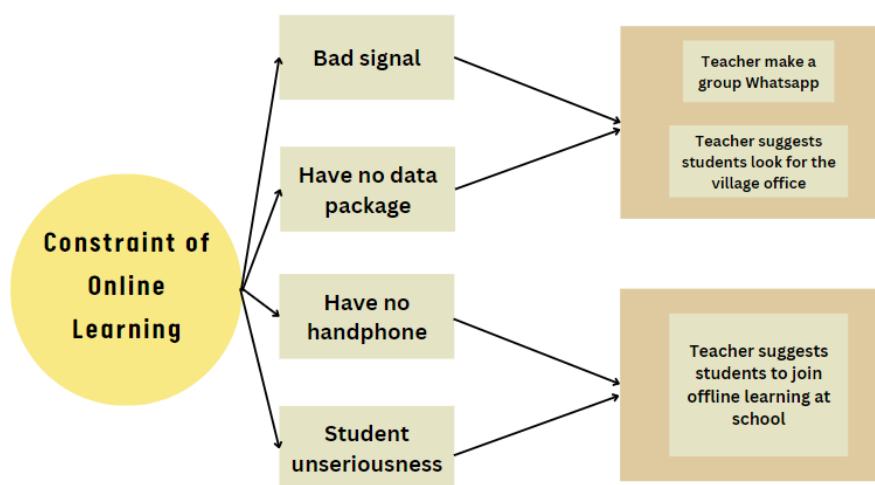


FIGURE 1: Constraint of online learning

Figure 1 shows the challenges in online learning faced by the teachers in the village and how the efforts of teachers to face those challenges. The shift to remote learning during the pandemic has brought about significant changes for teachers, schooling practices, and students alike. Educators in Desa Pangururan acknowledge acquiring new skills during the pandemic, particularly in remote teaching techniques and the utilization of instructional media suitable for online learning environments (Van Nuland et al., 2020). Post-pandemic, technology-based teaching tools have become more prevalent in schools. These changes have also impacted students' learning approaches, with many actively seeking educational resources on the internet. Figure 2 shows that transformation on offline learning. However, a majority of teachers perceive post-pandemic changes in students as a reduction in their ability to grasp learning materials optimally. Additionally, student discipline is deemed to have declined post-pandemic due to the shift to home-based learning, which has disrupted established study patterns. Teachers opine that remote teaching is less effective than face-to-face classes prior to the pandemic.

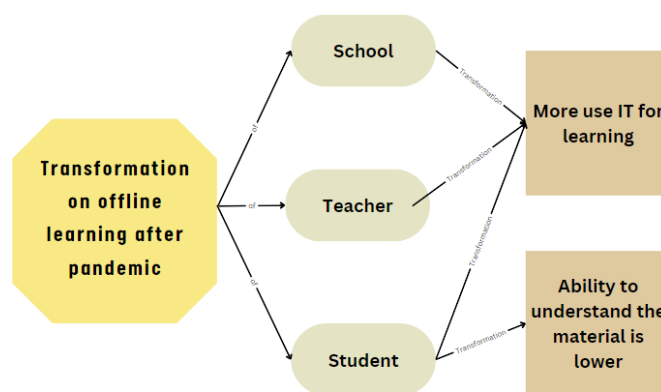


FIGURE 2. Transformation on offline learning

There are 17 out of 20 teachers having familiarized themselves with digital technologies before the pandemic hit Indonesia. Software used includes Zoom, Google Meet, Google Classroom, Quizizz, Discord, Whatsapp, Microsoft Teams, OneNote, YouTube, and Google Forms. 2 out of 20 teachers stated that online learning is as effective as traditional face-to-face learning, yet the majority believe that online learning is less effective. Challenges faced during online learning include occasional poor network connectivity, with most challenges related to students' behaviors, such as lack of seriousness and engagement during online classes, and issues with honesty during exams.

Teachers have implemented measures to address these challenges, including requiring students to turn on their cameras during lessons, preparing two cameras during exams, and actively engaging students, especially those with their cameras turned off.

Furthermore, online teaching impacts teachers' competencies, with only 0.05% of respondents, specifically one teacher with over 15 years of teaching experience, stating that they did not learn anything new during online teaching. The majority reported learning new skills aligned with the goal of optimizing online learning, such as video editing, creating mathematics learning content, learning English, mastering technology usage, and various techniques for online teaching (Pressley & Ha, 2021; Page et al., 2021; Padmanabhanunni & Pretorius, 2021; Naik et al., 2020).

As online teaching concludes and schools revert to in-person teaching, the use of information technology (IT) in schools becomes more widespread, including the use of instructional media and new tools for assessment. However, according to teachers, changes have also occurred in the demands of teaching. Teachers have lowered their teaching demands because, according to them, students' learning during online teaching was suboptimal, resulting in many fundamental concepts not being mastered by students.

CONCLUSION

Based on the findings and discussions, it's evident that the COVID-19 pandemic has brought about significant changes in education, particularly in rural areas like Desa Pangururan, Indonesia. The transition to remote teaching was a novel experience for math educators, many of whom had no prior experience with online instruction. While tools like Zoom, Google Meet, and Google Classroom facilitated remote lessons, math educators faced challenges related to electronic constraints and perceived shortcomings in student engagement.

In response to these challenges, educators implemented various strategies, including the use of WhatsApp groups for distributing materials, advising students to access alternative venues for internet connectivity, and adopting blended learning approaches. However, despite these efforts, educators expressed concerns about the effectiveness of remote teaching compared to traditional classroom instruction.

Post-pandemic, math educators in Desa Pangururan acknowledge acquiring new skills in remote teaching techniques and the use of instructional media suitable for online environments. However, they also perceive changes in students' learning approaches, with many students relying more on online resources but exhibiting reduced mastery of fundamental concepts. Additionally, there are concerns about declining student discipline and the perceived ineffectiveness of remote teaching compared to face-to-face instruction.

The findings also highlight the diverse experiences and adaptations made by educators with varying levels of teaching experience. While some teachers had prior experience with online teaching and found it to be effective, the majority struggled with challenges related to network connectivity, student behavior, and the perceived limitations of remote instruction.

As schools transition back to in-person teaching, the widespread use of information technology (IT) and instructional media is expected to continue. However, educators also anticipate changes in teaching demands, with a focus on addressing learning gaps resulting from the pandemic-induced disruptions.

Another finding of the study showed that the challenges faced by rural educators during the pandemic in Desa Pangururan, Indonesia mirror those experienced globally. Further research can explore the long-term impact of remote learning on rural education, particularly in terms of student learning outcomes and educators' continued professional development. Comparative studies across different rural contexts can also provide valuable insights into the diverse experiences and challenges faced by rural educators globally.

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