

Exploring Social Problems Through the Lens of Mathematics and Science Preservice Teachers

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ABSTRACT:

Education plays a vital role in preparing future citizens to address contemporary social challenges. This study explored the social problems that science and mathematics preservice teachers believe education should prioritize and examined how they envision their future roles in addressing these issues through STEM teaching. Using a qualitative photovoice design, 17 preservice teachers from a Philippine state university documented community issues through photographs, written reflections, and semi-structured interviews guided by the SHOWeD framework. Data were analyzed using reflexive thematic analysis. The findings identified three major social issues that participants considered educational priorities: poverty and its related concerns, environmental degradation and sustainability, and deficiencies in community facilities and infrastructure. Participants also envisioned three complementary roles as future educators: integrating social problem-solving into STEM instruction, promoting community engagement and educational advocacy, and empowering learners through scientific and mathematical knowledge. The findings reveal an emerging professional identity characterized by social responsibility, civic engagement, and a commitment to contextualizing STEM education within authentic community issues. The study highlights the value of photovoice in fostering critical reflection and providing deeper insights into preservice teachers' perceptions of social realities. It further emphasizes the importance of teacher education programs that prepare future STEM educators to connect disciplinary knowledge with meaningful community engagement and sustainable development.

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1. Introduction

Education is increasingly recognized as a powerful instrument for promoting both individual development and social

transformation. Beyond developing disciplinary knowledge and technical competencies, contemporary education is expected to prepare learners to understand, critically examine, and

respond to the complex social, economic, and environmental challenges confronting local and global communities. Persistent poverty, social inequality, environmental degradation, climate change, technological advancement, and educational disparities have reinforced the need for educational systems that cultivate not only academic competence but also ethical responsibility, civic engagement, and sustainable thinking (OECD, 2023; UNESCO, 2020). Within this context, teachers play a central role in shaping students' knowledge, values, and dispositions toward responsible citizenship. Consequently, the role of teachers has evolved from transmitting knowledge to facilitating authentic learning experiences that connect classroom instruction with real-world issues and encourage learners to investigate problems, evaluate evidence, and develop meaningful solutions (Darling-Hammond et al., 2020). These expectations closely align with the goals of Education for Sustainable Development, which emphasize preparing learners to contribute to more inclusive, equitable, and sustainable societies (UNESCO, 2020).

The growing emphasis on socially responsive education has further strengthened the importance of Science, Technology, Engineering, and Mathematics (STEM) education. Contemporary STEM education extends beyond developing competencies in science, technology, engineering, and mathematics by fostering critical thinking, creativity, collaboration, communication, and evidence-based problem-solving needed to address complex societal challenges (National Academies of Sciences, Engineering, and Medicine [NASEM], 2020). Educational reforms increasingly advocate contextualizing STEM learning through authentic community issues that require interdisciplinary thinking and the practical application of scientific and mathematical knowledge (Kelley & Knowles, 2016). Mathematics develops quantitative reasoning, statistical literacy, and mathematical modeling skills that support informed decision-making on issues such as poverty, disaster risk reduction, and economic development (Skovsmose, 2020), while

science education cultivates scientific literacy essential for addressing environmental sustainability, climate change, biodiversity conservation, and public health (Zeidler, 2014). As a result, STEM teachers are increasingly expected to cultivate not only disciplinary competence but also social responsibility and civic engagement among learners (Clark et al., 2024).

The success of socially responsive STEM education depends largely on teachers' beliefs and emerging professional identities. Research consistently shows that teachers' beliefs influence instructional decisions and classroom practices, and these beliefs begin to develop during preservice teacher education (Fives & Buehl, 2012). Consequently, teacher education programs are increasingly encouraged to provide authentic learning experiences that enable preservice teachers to critically engage with issues of equity, sustainability, inclusion, and social justice within their communities (Kitooke & Mahon, 2024). Among these approaches, photovoice has gained recognition as a participatory methodology that enables participants to document community realities through photographs accompanied by reflective narratives (Wang & Burris, 1997). By promoting critical reflection, learner agency, and contextualized understanding, photovoice offers a valuable means of examining how future teachers connect educational practice with community concerns.

Despite the growing body of literature on STEM education and teacher preparation, important gaps remain. Existing studies have largely emphasized academic achievement, conceptual understanding, technological integration, and problem-solving skills, while comparatively fewer have explored how science and mathematics preservice teachers perceive community social problems and how these perceptions shape their envisioned professional roles (NASEM, 2020). Moreover, studies investigating preservice teachers' social awareness have relied primarily on surveys, interviews, and reflective journals, with limited application of participatory visual methodologies such as photovoice (Zhang &

Hennebry-Leung, 2023). Previous research has also tended to examine issues such as environmental education, social justice, and community engagement independently rather than exploring their interconnected nature. These gaps are particularly evident in developing countries, including the Philippines, where poverty, disaster vulnerability, environmental sustainability, infrastructure limitations, and educational inequality remain pressing concerns that directly influence teaching and learning (UNESCO, 2024). Addressing these gaps can provide richer insights into how future STEM educators understand community realities and envision their roles in promoting socially responsive education.

Against this backdrop, this study employed photovoice methodology to explore the social problems identified by science and mathematics preservice teachers and to examine how they envision addressing these issues through their future teaching practices. By analyzing participants' photographs, reflective narratives, and interview accounts, the study contributes to the growing scholarship on socially responsive STEM education, teacher identity, and community-engaged pedagogy. More specifically, it sought to answer the following questions:

- (1) What social problems do science and mathematics preservice teachers perceive as educational priorities?
- (2) How do science and mathematics preservice teachers envision using their future teaching practices to address these social problems?

The findings provide insights that may inform teacher education programs in preparing future educators who can integrate disciplinary knowledge with social responsibility, sustainability, and meaningful community engagement.

2. Methodology

Research Design

This study employed a qualitative research design using photovoice methodology to explore how science and mathematics preservice teachers

perceived social problems within their communities and envisioned their future roles in addressing these issues through their teaching practices. Qualitative research is well suited for examining participants' lived experiences, meanings, and interpretations of complex social phenomena (Creswell & Poth, 2018). Developed by Wang and Burris (1997), photovoice is a participatory methodology that enables individuals to document community realities through photographs accompanied by reflective narratives. Grounded in critical pedagogy and participatory research, it empowers participants to identify community concerns, reflect on their significance, and propose possible actions. In this study, photovoice provided an appropriate platform for preservice teachers to move beyond verbal descriptions by visually documenting social issues they considered educational priorities and reflecting on how education, particularly STEM education, could contribute to addressing these challenges.

Participants

The participants were 17 preservice teachers enrolled in the Bachelor of Secondary Education major in Mathematics and Bachelor of Secondary Education major in Science programs. Purposive sampling was employed to recruit information-rich participants who could provide meaningful insights relevant to the objectives of the study. Eligible participants were those currently enrolled in the teacher education programs, had completed or were undertaking professional education courses, voluntarily agreed to participate, and had access to a mobile phone or digital camera for the photovoice activity. The sample size was considered appropriate because qualitative research prioritizes depth and richness of information rather than statistical representation.

Instruments

Data were collected using a photovoice protocol complemented by a semi-structured interview guide. Participants were asked to photograph social problems within their communities that they believed education should prioritize while observing ethical guidelines on privacy and safety.

They then selected representative photographs and prepared reflective narratives explaining the issue portrayed, its significance, the role of education in addressing it, and their envisioned responses as future STEM teachers. These reflections were followed by individual semi-structured interviews guided by Wang and Burris (1997) SHOWeD framework, which encouraged participants to describe, analyze, and critically reflect on the social issues depicted in their photographs. The integration of photographs, narratives, and interviews generated rich and contextualized qualitative data.

Data Gathering Procedure

Ethical approval and institutional permission were secured before data collection. Participants attended an orientation that introduced the objectives of the study, photovoice procedures, ethical guidelines, informed consent, confidentiality, and safety protocols. They were then given one week to document social issues in their communities through photographs and to prepare accompanying written reflections. Subsequently, individual semi-structured interviews lasting approximately 30 to 60 minutes were conducted with participants' consent and audio-recorded, while field notes were maintained to capture contextual observations. The collected photographs, reflective narratives, interview transcripts, and field notes were organized and prepared for analysis through verbatim transcription.

Data Analysis

The data were analyzed using reflexive thematic analysis following Braun and Clarke's (2021) six-phase framework. The researchers first familiarized themselves with the photographs, narratives, interview transcripts, and field notes before conducting inductive coding of meaningful segments. Related codes were organized into themes, which were reviewed, refined, and clearly defined to ensure that they accurately represented participants' shared experiences and perspectives. Representative quotations and corresponding photographs were incorporated into the presentation of the findings to preserve participants' voices. Triangulation of

multiple data sources enhanced the depth, credibility, and trustworthiness of the analysis.

Ethical Considerations

The study adhered to established ethical standards for qualitative research involving human participants. Informed consent was obtained after participants were fully informed about the study's objectives, procedures, potential risks and benefits, and their right to withdraw at any stage without penalty. Confidentiality and anonymity were ensured through the use of participant codes and secure storage of all research data. Because the study employed photovoice, participants received guidance on ethical photography practices, including obtaining permission before photographing identifiable individuals and avoiding unsafe or restricted locations. Any images containing identifiable persons or sensitive information were appropriately managed prior to dissemination, and participants' perspectives were reported respectfully to preserve their dignity and ensure accurate representation.

3. Results

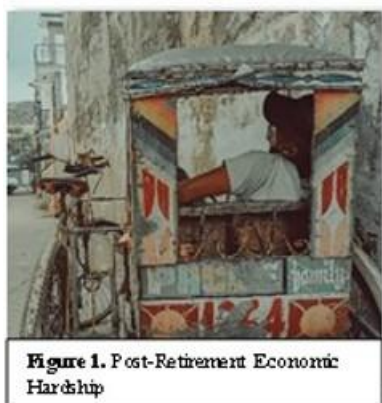
This study provides insights into how STEM preservice teachers perceive the social problems that education should prioritize and the roles they envision as future educators in addressing these challenges. The findings reveal that participants view education not merely as a means of academic instruction but as a transformative force for promoting social justice, equity, and sustainable community development. Their photovoice narratives demonstrate a nuanced understanding of the interconnected nature of social, economic, and environmental issues grounded in their lived community experiences. These findings also highlight the value of photovoice as a participatory methodology for eliciting contextualized perspectives while fostering critical reflection, social awareness, and civic engagement among preservice teachers (Wang & Burris, 1997).

Research Question 1: *What social problems do science and mathematics preservice teachers perceive as educational priorities?*

Theme 1: Poverty and its Multifaceted Issues

Among all identified themes, poverty emerged as the most pervasive social concern that participants believed education should prioritize. Rather than describing poverty solely as a lack of financial resources, participants portrayed it as a multidimensional phenomenon affecting employment opportunities, food security, housing stability, educational access, and overall human dignity. Their photographs highlighted how poverty permeates everyday life and creates structural barriers that prevent individuals from achieving economic security and social mobility.

One participant illustrated the economic struggles experienced by elderly individuals who continue working despite reaching retirement age as depicted in Figure 1.



"For many older individuals in the city, tricycle driving becomes an economic necessity rather than a choice." (P3)

Another participant emphasized the physical hardships associated with such work.

"Most of the time, a pedicab driver encounters a lot of challenges, like facing different weather conditions." (P2)

Child labor as depicted in Figure 2 emerged as another prominent manifestation of poverty. Participants viewed child labor not simply as children's participation in economic activities but as a consequence of persistent household deprivation that compromises children's educational opportunities and psychosocial development.

"The lack of economic resources pushes children into work at an early age, undermining their well-being and opportunities for education." (P10)



Homelessness likewise emerged as an important concern among participants. Rather than viewing homelessness solely as the absence of shelter, participants associated it with broader issues including unemployment, inadequate housing policies, forced displacement, and insufficient government support.

"The individual's worn-out clothes and the makeshift shelter reflect the harsh realities they face daily." (P11)



The accompanying photograph in Figure 3 illustrated the visible consequences of housing insecurity and highlighted the emotional and physical hardships experienced by individuals without stable housing. Participants recognized that homelessness represents both an economic and social exclusion issue, limiting individuals' access to education, healthcare, employment, and community participation.

Food insecurity was similarly portrayed as one of the most immediate and visible manifestations of poverty. One participant described a photograph depicting empty plates within a household.



"This image vividly portrays the daily struggle many individuals and families endure to meet their fundamental nutritional needs." (P11)

The photograph in Figure 4 symbolized more than temporary hunger. Instead, it reflected chronic deprivation affecting children's physical health, cognitive development, educational participation, and overall quality of life. Participants recognized that food insecurity often results from multiple interconnected factors, including unemployment, unstable income, inflation, and limited access to nutritious food.

Theme 2: Environmental Degradation and Sustainability

Environmental degradation and sustainability emerged as key social concerns that STEM preservice teachers believed education should prioritize. Their photovoice narratives portrayed environmental problems as consequences of human activities, inadequate environmental awareness, and unsustainable development practices, recognizing their far-reaching implications for human health, economic development, and community well-being. Rather than viewing these issues as purely ecological, the participants emphasized the need for educational approaches that cultivate environmental ethics, critical thinking, responsible citizenship, and collective action.

One of the most frequently discussed environmental issues among participants was improper waste disposal and ineffective waste management as depicted in Figure 5. Participants described how indiscriminate dumping of garbage into rivers has significantly altered the environmental quality of their communities,

transforming once healthy ecosystems into polluted waterways.

"Our river used to be clean and vibrant, but due to improper garbage disposal, it has turned unclean and is now overflowing with various wastes." (P1)

Similarly, another participant reflected on the deteriorating condition of local waterways.

"The dirty river and floating trash symbolize the harm done to ecosystems and to people's health." (P11)



Another environmental concern identified by participants was deforestation associated with infrastructure expansion and economic development. Participants observed that forested areas within their communities had been cleared to accommodate tourism facilities and airport construction.

"The land was cleared of the trees to make way for an airport." (P13)

This statement reflects participants' awareness of the complex relationship between economic progress and environmental conservation. Rather than opposing development outright, their reflections suggest concern regarding whether economic growth is being pursued sustainably and responsibly. The photographs portrayed environmental transformation as a visible consequence of development decisions that may generate economic opportunities while simultaneously threatening ecological stability.

Overfishing also emerged as an important environmental issue affecting participants' coastal communities. One participant described how declining fish populations have altered fishing practices among local fishermen.

"Due to the scarcity of fish caused by overfishing, fishermen have resorted to using nets with smaller holes to increase their catch." (P13)

This narrative illustrates participants' recognition of the cyclical relationship between environmental degradation and economic survival. As fish populations decline, fishermen may adopt increasingly unsustainable fishing methods to compensate for reduced catches, further accelerating marine resource depletion. The participants therefore viewed overfishing as both an environmental and socioeconomic problem that threatens biodiversity while undermining the livelihoods of coastal communities.

Theme 3: Issues on Facilities and Infrastructure

Another significant theme that emerged from the photovoice narratives was the issue of inadequate community facilities and public infrastructure. Participants identified limited water supply, deteriorating road networks, and recurrent flooding as pressing social problems that affect quality of life, access to essential services, and sustainable development. Their reflections reveal an understanding that infrastructure is a critical determinant of health, education, economic opportunity, and social equity. They also recognized that access to safe water, reliable transportation, and resilient infrastructure contributes significantly to community well-being and viewed education as a means of fostering civic responsibility, environmental awareness, and community participation in addressing these challenges.



Figure 6. Community Water Insecurity

Participant 5 highlights the issue of inadequate water supply in their community as illustrated in Figure 6. The photograph documented the daily struggles experienced by families who must travel considerable distances or purchase water because of limited access to reliable water sources.

"We must walk a long distance to access water for drinking." (P5)

This statement illustrates that inadequate water supply extends beyond physical inconvenience. It reflects inequalities in access to one of the most basic human necessities and highlights how deficiencies in public services disproportionately affect vulnerable communities. Participants recognized that the absence of accessible and safe drinking water creates financial burdens, consumes valuable time, and limits opportunities for education and productive work.

Participants 12 and 17 draws attention to the issue of damaged roads and highways in their barangay. Poorly maintained roads can lead to various problems, including traffic accidents, longer travel times, and difficulties in transporting agricultural goods to markets.

"The lack of reliable transportation infrastructure makes it challenging for residents to access markets, schools, and healthcare facilities." P17



Figure 7. Flooding and Drainage Infrastructure Failures

Participant 14 raised the issue of excessive flooding in their locality, particularly during the rainy season as shown in Figure 7. Flash floods usually occur during a sudden thunderstorm or

during the rainy monsoon season due to clogged drainage brought by improper solid waste disposals among the residents in the local communities.

"Our city faces excessive flooding, especially during the rainy season, which poses significant risks to the safety and well-being of its residents." P14

Research Question 2: *How do science and mathematics preservice teachers envision using their future teaching practices to address these social problems?*

Theme 1: Integrating Social Problem-Solving into Teaching Practices

The STEM preservice teachers envision their future roles by integrating social problem-solving into their teaching practices. They emphasize the importance of connecting classroom content to real-world issues, using project-based learning, Socratic questioning, role-playing, and simulations to engage students in addressing social problems. They believe that incorporating societal issues into the curriculum fosters critical thinking, empathy, and a sense of social responsibility among students.

"By connecting mathematical concepts to real-world issues, we can inspire students to see the relevance and practical application of mathematics in their lives." P14

"...connecting mathematical concepts to real-world issues... fosters a feeling of social responsibility by providing students with the tools and mindset necessary to make a difference in the world." P16

"Integrating strategies that encourage students to analyze and address real-world social issues, teachers can empower students to become agents of positive change." P17

Theme 2: Advocating for Policy Change and Community Engagement

The STEM preservice teachers envision their future roles in advocating for policy change and community engagement. They emphasize the need to collaborate with local organizations, schools, and stakeholders to create inclusive and encouraging environments for education. They recognize the role of STEM educators in raising awareness about social issues, engaging parents and families, and providing support and

mentorship to students facing educational obstacles.

"As future mathematics teachers, we have a unique opportunity to engage students in meaningful learning experiences... advocating policy change to tackle the root causes of access to education." P 16

Theme 3: Empowering Through Knowledge and Education

The STEM preservice teachers recognize the transformative power of education and aim to equip students with the knowledge and skills needed to tackle social issues. This includes educating the community on topics like waste disposal, providing free access to quality education to combat poverty, and incorporating environmental education into the curriculum to raise awareness about environmental challenges. They emphasize the importance of raising awareness and promoting understanding of social issues among their students. They believe that informed and empathetic individuals are more likely to engage in solving societal problems.

"STEM education empowers students to become more competitive and adaptable in a rapidly evolving global economy." P14

They envision their role as empowering students to become active participants in solving social problems. They aim to cultivate skills, knowledge, and mindsets that enable students to make a positive difference in their communities.

"By emphasizing mathematical literacy, problem-solving, and analytical skills, mathematics education can empower individuals to make informed decisions and contribute positively to their communities." P16

4. Discussion

The findings of Research Question 1 indicate that STEM preservice teachers possess a holistic understanding of the social issues that education should address. Through their photovoice narratives, they identified poverty, environmental degradation, and deficiencies in public facilities and infrastructure as interconnected challenges that influence educational opportunities, health, environmental sustainability, and social equity. Rather than viewing these concerns as isolated

community problems, participants recognized their structural and systemic nature, reflecting an emerging awareness of education as a catalyst for social transformation. These perspectives are consistent with contemporary views of socially responsive STEM education, which emphasize developing scientifically literate citizens capable of applying disciplinary knowledge to address authentic societal challenges.

The participants perceived poverty as a multidimensional condition extending beyond low income to include limited access to education, social protection, food, housing, and employment. Their narratives depicting older adults engaged in precarious work, child labor, homelessness, and food insecurity demonstrate an understanding that these conditions are interconnected and perpetuate cycles of disadvantage. This perspective aligns with international frameworks that conceptualize poverty as deprivation across multiple dimensions of well-being rather than income alone (United Nations Development Programme [UNDP], 2024; World Bank, 2022). Their observations regarding child labor, homelessness, and food insecurity likewise reflect evidence that these conditions adversely affect children's educational participation, cognitive development, and long-term socioeconomic mobility (Cooper & McCulloch, 2023; Gallegos et al., 2021). Collectively, these findings suggest that the participants view education as an avenue for promoting equity, expanding opportunities, and empowering learners to address structural inequalities through critical awareness and community engagement (OECD, 2023; UNESCO, 2024).

Environmental degradation emerged as another major concern, with participants highlighting pollution, improper waste disposal, deforestation, and overfishing as consequences of unsustainable human activities and weak environmental governance. Their reflections demonstrate an understanding that environmental problems are inseparable from public health, livelihoods, and community well-being, consistent with the principles of Education for Sustainable Development (UNESCO, 2020). Previous

studies likewise emphasize that sustainability education develops systems thinking, ethical reasoning, and collaborative problem-solving while fostering environmental stewardship (Filho et al., 2023). The participants' concerns over waste management, habitat destruction, and marine resource depletion parallel evidence linking these issues to biodiversity loss, climate vulnerability, food insecurity, and public health risks (Ferronato & Torretta, 2019; IPCC, 2023). These findings suggest that preservice teachers recognize STEM education as an important platform for cultivating environmental literacy, responsible citizenship, and sustainable community practices.

Participants also identified inadequate water supply, deteriorating transportation systems, and recurrent flooding as pressing community concerns that affect health, education, economic productivity, and quality of life. Their narratives reveal an appreciation of infrastructure as a fundamental component of sustainable development and social equity, consistent with the Sustainable Development Goals on clean water, resilient infrastructure, and sustainable communities. Water insecurity, poor road conditions, and flooding were understood not merely as physical deficiencies but as issues of accessibility, governance, and environmental management that disproportionately affect vulnerable populations (Dibaba et al., 2024; IPCC, 2023). By linking these concerns to disaster preparedness, environmental stewardship, and community participation, the participants demonstrated a systems perspective that aligns with contemporary STEM education promoting authentic problem-solving and civic engagement. These findings portray STEM preservice teachers as developing a professional identity that views education as a means of fostering resilient, equitable, and sustainable communities.

The findings of Research Question 2 further reveal that STEM preservice teachers envision their future roles as extending beyond content instruction to becoming facilitators of social change through teaching, advocacy, and community engagement. Their reflections

emphasize contextualizing STEM learning within authentic community issues, empowering students to become critical thinkers and responsible citizens, and strengthening partnerships among schools, families, and communities. These perspectives reflect contemporary conceptions of teacher professionalism that integrate disciplinary expertise with civic leadership, sustainability, and social responsibility.

The participants envisioned STEM classrooms where science and mathematics are connected to authentic community issues such as poverty, environmental degradation, disaster preparedness, and public health. Their preference for learner-centered approaches, including project-based learning, Socratic questioning, simulations, role-playing, and collaborative inquiry, aligns with socially responsive STEM education that promotes critical thinking, collaboration, ethical reasoning, and evidence-based decision-making (Chen & Yang, 2019; Valeeva et al., 2023; Wijnia et al., 2024). Their emphasis on mathematical modeling, critical mathematics education, and the integration of social justice and sustainability into STEM learning likewise reflects emerging perspectives that position STEM disciplines as tools for understanding and addressing societal challenges (AlAli et al., 2023; Skovsmose, 2020; Xenofontos et al., 2020). These findings resonate with transformative education, constructivist learning theory, Education for Sustainable Development, and twenty-first century competency frameworks, highlighting an emerging professional identity grounded in socially responsive teaching (UNESCO, 2020; OECD, 2023).

Beyond classroom instruction, participants envisioned themselves as advocates for educational equity and active partners in community development. They recognized that addressing complex social problems requires collaboration among schools, families, local government units, community organizations, and policymakers, reflecting ecological perspectives of education and contemporary views of teacher professionalism (Darling-Hammond, 2022;

OECD, 2023). Their emphasis on mentoring, parental engagement, inclusive education, and service-learning demonstrates an understanding that teachers contribute to students' academic, social, and emotional development while strengthening equitable access to learning opportunities (UNESCO, 2020). These findings suggest that participants view teachers not only as classroom practitioners but also as civic leaders capable of fostering community participation and supporting sustainable development initiatives.

The participants also viewed education as a transformative means of empowering individuals and communities through scientific literacy, mathematical reasoning, technological competence, and higher-order thinking. They envisioned schools as centers for promoting environmental sustainability, responsible waste management, poverty reduction, and equitable educational opportunities, consistent with research highlighting the role of environmental, health, financial, and digital literacy in strengthening informed decision-making and community resilience (OECD, 2023). Their emphasis on mathematical literacy, inquiry, and problem-solving reflects contemporary mathematics education that prioritizes quantitative reasoning and evidence-based decision-making (OECD, 2023), while their concern for educational equity aligns with human capital theory, the capability approach, and transformative learning theory, all of which view education as expanding opportunities for meaningful social participation (Murray, 2023; World Bank, 2022). Taken as a whole, the findings indicate that STEM preservice teachers perceive education not merely as preparation for employment but as a powerful instrument for advancing equity, sustainability, community well-being, and responsible citizenship.

5. Conclusion

This study explored STEM preservice teachers' perspectives on the social problems that education should prioritize and how they envision addressing these issues through their future teaching practices. The findings reveal that the participants possess a socially responsive view

of education, recognizing its role not only in developing academic competence but also in promoting equity, sustainability, and community well-being. They identified poverty, environmental degradation, and deficiencies in community facilities and infrastructure as the most pressing issues requiring educational attention. Rather than perceiving these concerns as separate challenges, they understood their interconnected effects on health, educational access, economic opportunities, environmental quality, and quality of life. Their reflections suggest that education can empower learners to critically examine community issues and contribute to sustainable and socially responsible solutions.

The participants also envisioned themselves as educators whose responsibilities extend beyond classroom instruction. They emphasized integrating authentic social issues into STEM learning through contextualized and learner-centered approaches such as project-based learning, inquiry, mathematical modeling, and collaborative problem-solving. In addition, they viewed teachers as advocates for environmental stewardship, educational equity, and community engagement who collaborate with families, schools, and local stakeholders to address community concerns. Collectively, these findings point to an emerging professional identity that combines strong disciplinary knowledge with

civic responsibility, highlighting the potential of socially responsive STEM education to develop scientifically literate, environmentally conscious, and socially engaged citizens.

Based on these findings, several recommendations are proposed. Teacher education institutions may expand opportunities for community-based and experiential learning, including service-learning, mathematical modeling, project-based learning, and photovoice, to strengthen preservice teachers' capacity to connect STEM concepts with authentic societal issues. Curriculum developers may further integrate sustainability, disaster resilience, environmental stewardship, and social problem-solving across STEM courses to promote both disciplinary competence and civic responsibility. Schools, local communities, and policymakers may foster stronger partnerships that support community engagement, interdisciplinary learning, and socially responsive STEM instruction through collaborative programs and professional development. Finally, future studies may include participants from multiple institutions and geographical contexts or employ comparative, mixed-methods, and longitudinal designs to provide broader evidence on the development and classroom enactment of socially responsive teaching among STEM educators.

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8. Author Declaration

The author declares that this manuscript is an original work. All sources of information have been appropriately acknowledged and cited in accordance with accepted scholarly and ethical standards. The author also declares that there are no financial, professional, personal, or institutional conflicts of interest that could have influenced the conduct of the study, the interpretation of the findings, or the preparation of this manuscript.