

Editorial

PED Volume 42, Issue 2: Special Issue on Science Education Development in the Digital Age

Dear readers,

The publication of this Special Issue of *Papers in Education and Development (PED)*, Volume 42, Issue 2, emerges as a key outcome of the 2nd China-Africa Forum on Science Education, held on 12 July 2024 at the University of Dar es Salaam (UDSM), Tanzania. Co-hosted by the School of Education at UDSM and the College of Education at Zhanjiang Normal University, China, the forum brought together researchers, educators, and policymakers to explore the evolving landscape of science education in the digital era. Discussions highlighted how digital technologies are reshaping the teaching, learning, and assessment of science subjects—creating both opportunities and challenges for educators and learners. The forum centred on several critical themes, including:

- Opportunities and challenges of science education in the digital age.
- Science teacher education and professional development in digital contexts.
- Innovations in curriculum and pedagogy within technology-driven learning environments.
- Digital learning environments and assessment approaches.
- Inclusive science education through digital tools.

These discussions underscored the need to foster digital literacy among educators, reimagine pedagogical approaches, and ensure equitable access to digital resources, particularly in under-resourced settings.

Key Themes Emerging from This Special Issue

This Special Issue presents **eleven research articles** that examine diverse dimensions of science education development in the digital age. The contributions coalesce around several overarching themes:

Teachers' beliefs and ICT integration in science education

A significant theme in this issue revolves around teachers' beliefs, perceptions, and readiness to integrate ICT into science and mathematics instruction. Rimba and Tarmo examine how secondary school teachers' beliefs about ICT influence their adoption of digital technologies in science and mathematics classrooms. Similarly, Chuma and Raphael employed the Technology Acceptance Model (TAM) to examine how perceptions of usefulness and ease of use influence teachers' engagement with digital tools and ICT use in instruction. Collectively, these insightful studies underscore the need to address teachers' attitudes and digital literacy skills as fundamental prerequisites for ICT adoption in science education.

Pedagogical innovations and instructional strategies in science and mathematics

Several studies in this issue investigate the effectiveness of various teaching strategies in science and mathematics education. Buzza and Kitta provide empirical evidence for the superiority of experimentation methods in improving students' learning outcomes in geometry. Mhewa et al. focus on the jigsaw collaborative method and its impact on mathematics instruction, while Kahise explores the integration of neuroeducation principles into mathematics teaching, revealing gaps between theoretical knowledge and practical implementation. These studies highlight the importance of innovative pedagogies and active learning approaches that go beyond traditional rote-based instruction to foster meaningful learning experiences in science education.

Student participation and learning outcomes in science and mathematics

The factors influencing students' engagement in science and mathematics subjects also feature prominently. Kyaruzi's study identifies key predictors of students' participation in these subjects, including prior academic performance, teacher feedback, and parental education levels. Mbata, Timothy, and Maro investigate how guided inquiry-based experiments enhance students' acquisition of physics practical skills, advocating for experiential learning approaches in science education. These contributions reinforce the need for learner-centred pedagogical approaches to improve student engagement and achievement in STEM disciplines.

Digital technologies and inquiry-based learning in science education

The role of digital technologies and inquiry-based learning in facilitating science education is another critical theme explored in this issue. Manaseh's study examines the challenges and proposed initiatives for integrating digital technologies into primary school science education in rural Tanzania, highlighting the need for infrastructural support and policy interventions. Luvanga et al. investigate the opportunities for integrating inquiry-based learning in chemistry teaching, emphasising the potential of technology to enhance inquiry-driven learning. These studies underscore the importance of equipping schools with digital resources to support effective science teaching and learning.

Digital literacy and open educational resources (OER) teacher colleges and universities

Two studies focus on digital learning and curriculum relevance in teacher education and universities. Chalale et al. explore the perspectives of computer science student-teachers and tutors on the relevance of curriculum content for ICT-mediated teaching, calling for curriculum enhancements to align with digital education needs. Bhalalusesa examines the challenges and perceptions surrounding Open Educational Resources (OER) in Tanzanian higher education institutions, advocating for policy frameworks and capacity-building initiatives to enhance OER adoption. These studies highlight the evolving role of digital literacy and open-access resources in shaping the future of science education in teacher training and higher learning institutions.

Conclusion

The articles in this Special Issue collectively offer a thorough understanding of science education in the digital era, addressing both its transformative potential and inherent challenges. The research highlights the need for:

- ✓ Holistic teacher professional development that integrates technical training and attitudinal change towards digital tools.
- ✓ Pedagogical innovations that enhance student engagement, inquiry-based learning, and critical thinking.
- ✓ Strategic policy interventions to bridge digital divides and promote equitable access to technology-enhanced learning.
- ✓ Capacity-building initiatives to support OER adoption and strengthen digital literacy in higher education.

As science education continues to evolve, collaborative efforts among educators, researchers, and policymakers will be critical in ensuring equitable and effective integration of digital technologies.

Acknowledgements

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Chief Editor

Prof. Eustella P. Bhalalulesa

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