Mathematical Modelling as a Pathway to Creative and Critical Teacher Development

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Abstract

Preparing future mathematics teachers requires more than transmitting content knowledge; it demands cultivating the capacity to think critically, adapt flexibly, and learn independently. This paper uses the metaphor of the *Syzygium* (Water-Berry) tree to illustrate how mathematical modelling can become a living pedagogy — with roots grounded in authentic inquiry, branches extending into diverse approaches, and fruits representing reflective and adaptive reasoning. Informed by constructivist and developmental learning theories, the study examines case-based experiences of pre-service mathematics teachers who engaged with real-world modelling challenges, such as estimating the height, crown volume, and leaf mass of a tree. The analysis demonstrates that such open-ended and context-rich tasks promote creativity, problem-solving, critical evaluation, collaboration, and self-directed learning (SDL). The paper argues that embedding modelling within teacher education holds significant potential for curriculum renewal, innovative assessment practices, and the professional formation of teachers who can embody and foster creativity, criticality, and adaptability in their own classrooms.

Keywords

Mathematical modelling, Creativity, Critical thinking, Self-directed learning, Teacher education, Syzygium metaphor.