Leaves on a Tree: Fostering Self-Directed Learning Through Mathematical Modelling

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Abstract:

This qualitative case study explores how a real-world problem—estimating the number of leaves on a tree—can foster self-directed learning through mathematical modelling. The study aims to understand how engaging students with an open-ended, context-rich problem encourages them to develop mathematical modelling competencies, critical thinking, and independent learning strategies. Through sampling, data collection, and analysis, students were guided to formulate their own models, test hypotheses, and refine their estimation techniques. Data was gathered through observations, interviews, and student journals, providing insights into their learning processes, challenges, and strategies for problem-solving. The findings reveal that students who engaged in this activity developed deeper mathematical understanding, improved their ability to make and adjust estimates, and became more confident in taking ownership of their learning. The study concludes that using real-world problems like counting leaves on a tree not only enhances mathematical modelling competencies but also promotes a mindset of self-directed learning, where students actively engage in inquiry, reflection, and iterative thinking. These insights offer valuable implications for integrating experiential learning activities into mathematics education to cultivate both content knowledge and essential learning skills.

Keywords:

Mathematical Modelling Competencies, Self-Directed Learning, Pre-Service Mathematics Teachers.