Rethinking Science Teaching for the 21st Century: A SWOT Analysis of a Multi-Strategic Model

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Introduction

❑ The rapid evolution of scientific knowledge, coupled with the complexity of professional demands in science-related fields, calls for innovative pedagogical approaches that move beyond traditional, lecture-based instruction.

❑ In science education, there is a growing emphasis on fostering deep learning, critical thinking, autonomy, and transferable skills essential for lifelong learning and adaptability [1,2].

❑ The Integrated Multi-Strategy Teaching in Science (**IMTS**) approach responds to these imperatives by blending diverse evidence-based strategies into a cohesive model, ensuring development of essential academic and professional skills aligned with the needs of 21st-century science graduates.

Aims

❑ Report the IMTS practice and present a SWOT analysis of the methodology as applied in a university-level science course. based on student outcomes and engagement levels, and the reflective input of the faculty members.

❑ Identify benefits and limitations of the model, as well as its potential for scaling and institutional integration across academic contexts..

Methodology

IMST Pedagogical Model

Pre-Class Engagement
Students engage with research materials and self-study, supported by curated content

Post-Class Reflection
Students reflect on learning and assess peers

In-Class Activities
Interactive activities ensure active participation

Oral presentations
Students deliver presentations and engage in discussions.

Problem-solving
Students work together to solve given tasks

Role-plays
Students act out scenarios to communicate & understand concepts

Interactive in-class activities

Assessment Methods

01 Written Reports
02 Oral/Poster Presentations
03 Structured Peer Reviews
04 OSCPE Exam

Online Survey
(1-10 continuous scale)
2024-2025
4th-year
pharmacy students
(n=64; 96.6%)
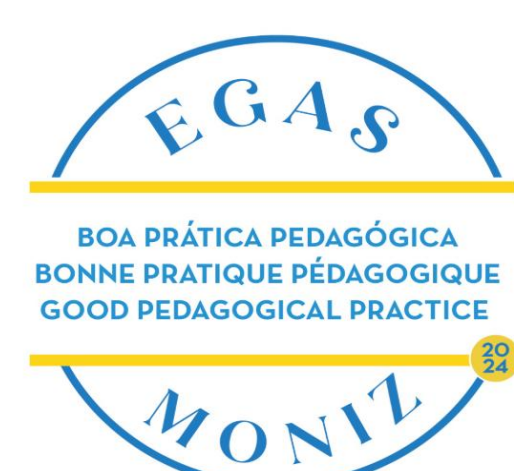
Faculty Reflection
Independent evaluation

SWOT Analysis

Results

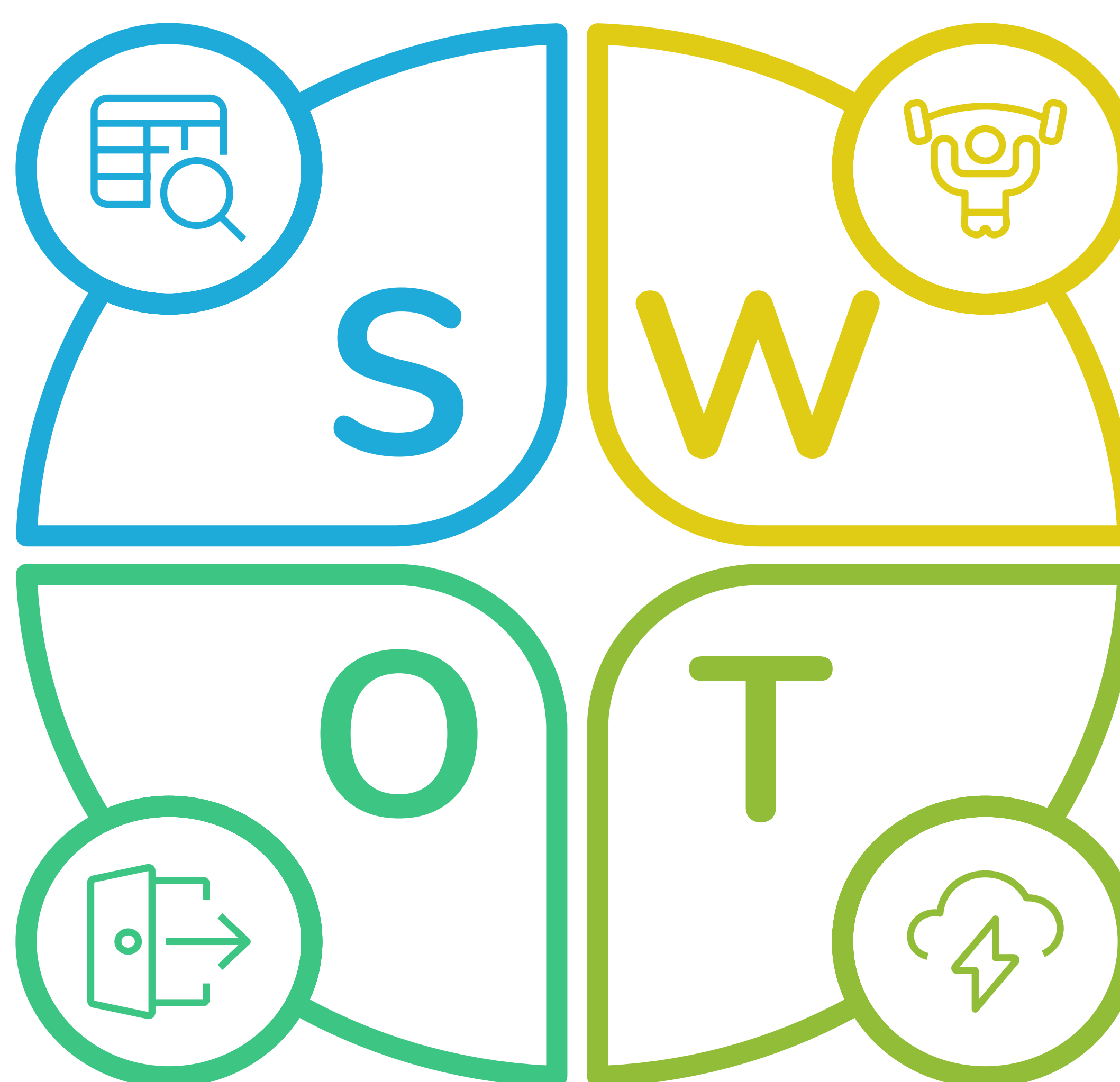### Enhanced Learning Outcomes

✓ Active student involvement and responsibility (7.11)

✓ Skill development: research (7.56), communication (6.87), critical thinking (7.10)

✓ Promotes learning efficiency (6.81) and integration of content

✓ Varied, dynamic activities (peer evaluation, role-play, OSCPE) enhance engagement

✓ Final projects mimic real-life tasks and support curricular integration

Implementation Challenges

✗ High time demand for students (8.35) and professors (prep/grading)

✗ Moderate enjoyment (6.52) and low enthusiasm (5.81)

✗ Limited class time for in-depth discussion or individual feedback

✗ Difficulties with large groups, peer-review logistics, and Moodle data handling

✗ Challenges for students with low autonomy or English proficiency

Expansion and Improvement

✳ Recognized as Good Pedagogical Practice (2024)

✳ Transferable across disciplines and adaptable to other curricula

✳ AI integration enhances real-world alignment

✳ Gamification and flexible assessment strategies can boost motivation

Potential Drawbacks

⚠ Student resistance to non-traditional methods or self-directed work

⚠ Risk of inequity for less prepared students

⚠ Burnout risk for faculty; limited infrastructure support

S W O T

Combined SWOT analysis integrating the perspectives of students (grade in parenthesis) and professors, highlighting commonalities and contrasts.

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Conclusions

❑ The IMST model **effectively cultivates active learning, professional competencies, & curricular integration**.

❑ While **students and professors alike recognize its educational value**, its sustainability depends on addressing structural, logistical, and motivational barriers.

❑ Balancing **innovation with realistic workload expectations and inclusive design** is key to broadening its acceptance and impact across diverse learning environments.

1. Biggs, J.; Tang, C.; Kennedy, G. Teaching for Quality Learning at University; 5th ed.; Open University Press - McGraw Hill:, 2022 ISBN 9780335250820.

2. Prince, M. Does active learning work? A review of the research. J. Eng. Educ. 2004, 93, 223–231.

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