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20TH AUGUST 2025

TRANSFORMING EDUCATION, DRIVING INNOVATION AND
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SMART MICRO-CREDENTIALS IN HIGHER EDUCATION: ENHANCING STUDENT ENGAGEMENT IN PROBABILITY LEARNING

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ABSTRACT

In an era where digital learning continues to transform the educational landscape, micro-credentials have emerged as a viable alternative to traditional degree programs. This study investigates the effectiveness of micro-credentials in Probability education within the UiTM Learning Management System (LMS), particularly the Ufuture platform (<https://ufuture.uitm.edu.my/courses/overview/UMC379>). The research aims to evaluate student satisfaction, knowledge acquisition, and engagement in the micro-credential course Counting and Probability, offered at UiTM. By leveraging learning analytics, the study examines student interactions, assessment results, and engagement patterns to provide actionable insights into the efficacy of micro-credentials in statistical education.

Using a survey-based quantitative approach, data was gathered from 74 undergraduate students enrolled in the micro-credential course, assessing seven key dimensions: knowledge gain, content relevance, assessment effectiveness, confidence improvement, instructional delivery, instructor approachability, and overall enjoyment. Statistical techniques, including descriptive analysis and correlation analysis were applied to interpret student responses. The findings reveal a high level of satisfaction, with an average rating above 4.6 across all dimensions. The strongest correlation was identified between engaging instructional methods and overall enjoyment, underscoring the importance of interactive pedagogical strategies. Micro-credentials developed within Ufuture UiTM are structured to facilitate self-paced learning while maintaining rigorous academic standards. The Counting and Probability module covers fundamental probability concepts, including Set Theory, Probability Rules, and Bayes' Theorem, incorporating adaptive learning technologies, gamification, and interactive problem-solving exercises. Learning analytics data from Ufuture revealed that students engaging with interactive content demonstrated higher assessment scores and improved retention rates compared to those relying solely on textual materials. Furthermore, instructor

accessibility and assessment clarity emerged as critical factors influencing learner confidence and engagement. While the study confirms the effectiveness of micro-credentials in Probability education, minor disparities in satisfaction levels suggest potential areas for improvement. Specifically, personalized feedback mechanisms, real-world application scenarios, and adaptive learning pathways should be enhanced to address diverse learner needs. The integration of AI-driven learning recommendations and peer interaction forums is recommended to further elevate engagement and learning outcomes. This research contributes to the broader discourse on micro-credentials in higher education, offering empirical evidence on their impact in Probability education. Future initiatives should focus on optimizing content delivery through data-driven instructional design and expanding micro-credential offerings in other mathematical domains. By leveraging learning analytics, UiTM's Ufuture platform can continue to refine its digital learning ecosystem, ensuring a student-centric, data-informed approach to higher education.

Keywords: *Micro-Credentials; Learning Analytics, Probability Education, Digital Learning, Ufuture UiTM*

INTRODUCTION

The rapid expansion of digital education has led to the adoption of micro-credentials as a flexible and competency-based learning approach. Probability is a fundamental subject in many disciplines, and students often struggle with its abstract nature. The introduction of micro-credentials via UiTM's Ufuture platform aims to provide an accessible and interactive learning experience that enhances conceptual understanding. This study examines the effectiveness of micro-credentials in Probability education through learning analytics, measuring student engagement, assessment performance, and satisfaction levels (Chek et al., 2023; Krismanto & Tahmidaten, 2022; Lee et al., 2020; Shamir-Inbal & Blau, 2020; Wang & Xu, 2016; Yang et al., 2020).

METHODS

The rapid expansion of digital education has led to the adoption of micro-credentials as a flexible and competency-based learning approach. Probability is a fundamental subject in many disciplines, and students often struggle with its abstract nature. The introduction of micro-credentials via UiTM's Ufuture platform aims to provide an accessible and interactive learning experience that enhances conceptual understanding. This study examines the effectiveness of micro-credentials in Probability education through learning analytics, measuring student engagement, assessment performance, and satisfaction levels. The survey assessed seven key dimensions of student satisfaction: knowledge acquisition, content relevance, assessment effectiveness, confidence improvement, instructional delivery, instructor approachability, and overall enjoyment. Statistical analysis techniques, including descriptive statistics, and Pearson correlation analysis were utilized to interpret the findings (Abror, 2022; Cerón et al., 2021; Gandomkar et al., 2020; Jossberger et al., 2020; Yu et al., 2020).

RESULTS AND DISCUSSION

Table 1 presents the summary of learner satisfaction ratings across different dimensions. Basically, the high satisfaction across all categories, which category has a mean score above 4.6, indicating that students generally had a positive learning experience. The standard deviations ranged between 0.45 and 0.55, showing that most students had similar perceptions.

Table 1.: Learner Satisfaction Ratings

Category	Mean	Standard Deviation	Min	Max
Knowledge Acquisition	4.75	0.45	3	5
Content Relevance	4.70	0.48	3	5
Assessment Effectiveness	4.65	0.50	3	5
Confidence Improvement	4.60	0.55	3	5
Instructional Delivery	4.72	0.47	3	5
Instructor Approachability	4.68	0.49	3	5
Overall Enjoyment	4.73	0.46	3	5

A Pearson correlation analysis was conducted to examine relationships between different factors of learner satisfaction. The strongest correlation was observed between engaging instructional methods and overall enjoyment ($r = 0.90$), indicating that interactive learning significantly enhances student satisfaction. Additionally, students who reported high levels of knowledge acquisition also exhibited greater confidence ($r = 0.83$). The findings highlight the need for enhanced interactive elements, including AI driven recommendations, gamified learning techniques, and peer-based discussion forums to further improve engagement and learning retention (Chek et al., 2019; Ekrami et al., 2020; Ismail et al., 2023).

CONCLUSION

This study confirms the high effectiveness of micro-credentials in Probability education through learning analytics-based assessments. Key findings suggest that interactive instructional methods, instructor accessibility, and well-structured assessment frameworks significantly impact student satisfaction. Recommendations include implementing adaptive learning strategies, real-world application scenarios, and enhanced feedback mechanisms to further optimize UiTM's Ufuture micro-credential offerings (Ismail et al., 2019).

ACKNOWLEDGEMENTS

This teaching innovation was supported by Universiti Teknologi MARA (UiTM) and the iCEPS initiative. The authors express gratitude to UiTM Perak Branch for their contributions in developing the uFuture Micro Credential platform and to all participants for their valuable insights.

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