Pertanika Proceedings 1 (3): 23 -25 (2025)

PERTANIKA JOURNALS

PERTANIKA PROCEEDINGS

Journal homepage: http://www.pertanika.upm.edu.my/

Active Learning Pattern Among Vocational Students: A Sequential Analysis

Eddy Azhar Jalani*, Muhd Khaizer Omar and Thinagaran Perumal

Faculty of Educational Studies, Universiti Putra Malaysia, Serdang 43400, Malaysia
Faculty of Computer Science And Information Technology, Universiti Putra Malaysia, Serdang 43400, Malaysia

ABSTRACT

This study explores the active learning patterns of vocational students in practical activities using topics related to the Internet of Things (IoT). Conducted as a case study, the research employs a combination of content analysis and sequential analysis. Active learning is implemented by assigning students practical tasks to build control systems using IoT technology. A coding scheme, defined with phrases to categorize data segments according to the studied themes, serves as a reference for evaluators to interpret students' actions and skill development during IoT-based practical tasks. The Generalized Sequential Querier (GSEQ) software is used to analyse sequential data by interpreting significant z-score values.

Keywords: Active learning, Internet of Things, practical lab activity, sequential analysis

INTRODUCTION

The emergence of the Internet of Things (IoT) has revolutionized various industries, necessitating the integration of IoT curricula into technical and vocational education and training. The practical nature of learning IoT demands hands-on experience, which is difficult to convey through traditional teaching methods. TVET instructors are struggling to adapt to the rapid technological changes brought about by the 4.0 industrial revolution, including the integration of IoT technology (Tshong & Yasin, 2023). UNESCO Education 2030 framework recognizes three principles to ensure quality education among the masses: inclusiveness, quality education, and lifelong learning. Several techniques from active learning (AL) are included in blended learning (BL), and by emphasizing student-centred learning in a far more real-world setting, these tactics enable more successful and captivating learning opportunities (Kumar et al., 2024).

ARTICLE INFO

Article history:
Received: 30 April 2025
Published: 17 July 2025

DOI: https://doi.org/10.47836/pp.1.3.005

E-mail addresses:
gs61949@student.upm.edu.my (Eddy Azhar)
khaizer@upm.edu.my (Muhd Khaizer Omar)
thinagaran@upm.edu.my (Thinagaran Perumal)
* Corresponding author

e-ISSN: 3083-9475

The construction of skills by students will be investigated in this study. Once their skill construction behaviours have been identified, a more thorough investigation will be conducted to see how they have advanced in the process and what strategies they have employed. Therefore, the goals of the research are to investigate students' active learning patterns when constructing skills in practical activities based on IoT, to identify students' strategies when constructing skills in practical activities based on IoT, and to identify the transition state of skill constructing strategies in practical activities based on IoT.

PROBLEM STATEMENT

Practical learning at the Malaysian Vocational College is now run guided by a set of practical sheets containing steps of work that have been set by the lecture to achieve learning objectives. This situation makes students only able to build skills at a low level and have limitations in exploring the practical activities they want to carry out.

RESEARCH QUESTION

Acceptance of students to this new technology raises several questions: (1) What are the active learning patterns of students that construct skills in practical activities based on the IoT? (2) What are students' strategies when constructing skills in practical activities based on the IoT? and (3) What is the transition state of skill construction strategies in practical activities based on the IoT?

This study employed the content analysis technique to investigate students' skills construction behaviours in doing practical activities based on IoT by analysing the report scripts written by the students. Based on a coding scheme, content analysis is applied to the report scripts students write for practical activities based on IoT. The coding scheme-based characterization, this study used a unit of meaning for objectivity.

For the purpose of reliability, the two raters have coded 381 messages in 3 continuous coding sessions. Table 1 shows the percentages of reliability agreement between them.

The total number of codes from 28 respondents is 340 after going through the evaluation process by two appointed raters (Table 2).

Table 1
Percentages of reliability agreement between the raters

Total code	Code gives the unit of meaning	Code agreement	Reliability percentage %
381	361	340	94

Table 2
Number of codes generated for respondents who successfully and unsuccessfully built an IoT system

Respondents	Total code	Code percentages %
Successfully built an IoT system	229	60.7
Unsuccessfully built an IoT system	111	39.3

CONCLUSION

Conclusively, this study is exploring the active learning pattern of students doing practical activities based on the IoT. The Generalized Sequential Querier (GSEQ) software is used to analyse sequential data by interpreting significant z-score values. After data analysis is done, students' skills construction can be revealed through the learning patterns and transition state diagrams that depict the initiation and follow-up strategies of students to construct skills while doing practical activities based on the IoT.

ACKNOWLEDGEMENT

The authors thank Universiti Putra Malaysia (UPM) and the Ministry of Education (MoE) Malaysia, specifically Kuala Klawang Vocational College, for their support in making this project possible. This work was supported by the Research University Grant (GP-IPS/2022/9735400) initiated by UPM and MoE as a scholarship.

REFERENCES

Kumar, A., Malhotra, S., Dias, I., & Lee, K. (2024). Active blended learning model for teaching iot application development course: Case study. *Journal of Engineering Education Transformations*, 425-431. https://doi.org/10.16920/jeet/2024/v37is2/24070

Tshong, P. K., & Yasin, R. M. (2023). TVET educational learning strategies and thier impact on student: A systematic literature review. *International Journal of Academic Research in Psychology*, 1790-1813. http://dx.doi.org/10.6007/IJARBSS/v13-i11/19558

UNESCO. (2021). UNESCO Strategy for TVET (2022-2029). *United Nations Educational, Scientific and Cultural Organization*.