

Determination STEM (Mathematics) Blended Learning Criteria via Fuzzy AHP Method

Durrani Aimi Abdul Malik^{a)} Yuhani Yusof^{fb)} & Ku Muhammad Na'im Ku Khalif^{c)}

Centre for Mathematical Sciences, College of Computing and Applied Sciences, Universiti Malaysia Pahang, Lebuhr Persiaran Tun Khalil Yaakob, 26300 Kuantan, Pahang, Malaysia.

Corresponding Author: ^{b)} yuhani@ump.edu.my
^{a)} durranaيمي84@gmail.com ^{c)} kunaim@ump.edu.my

Abstract. Due to the decreasing number of students' interest in the Science, Technology, Engineering, and Mathematics (STEM) field in Malaysia, educators need to instill students of STEM education in teaching and learning to face the IR 4.0 revolution. However, due to the COVID-19 pandemic and the recent curriculum change may challenge educators in implementing STEM (Mathematics). Thus, blended learning is relevant in maintaining the maximum students' higher thinking skills by integrating the STEM-Mathematics criteria in teaching and learning. Proper selection of STEM (Mathematics) criteria can ensure high-impact achievement and the fulfilment of the Ministry of Education's aspirations. This study proposes the STEM criteria needed in Mathematics subjects via the fuzzy Analytic Hierarchy Process (AHP) method. This study aims to evaluate the STEM (Mathematics) criteria weight for identifying the appropriate STEM (Mathematics) criteria needed in blended learning. First, the potential of STEM (Mathematics) criteria and the standard curriculum for secondary school were identified by the literature review and evaluated by distributing questionnaires to 31 expert mathematics educators. Then, fuzzy AHP is utilised to illustrate the proposed approach. The results depicted the ranking order of the STEM (Mathematics) criteria using linguistic scales.

INTRODUCTION

In the era of IR 4.0, Malaysia is urged to produce human resources with STEM skills to face the new scientific research and technology. However, since 2019 the statistics indicated that student's interest in STEM diminished throughout their secondary schooling period. Thus, the Ministry of Education via Wave 3 Malaysia National Education Blueprint (2013-2025) focuses on educators to increase students' interest in STEM education by finding the best practice for teaching and learning [1]. With technological advancement, the learning process has been integrated with digitalisation. However, educators face the complexities, uncertainties and changing understanding of education, mainly in teaching and learning. Educators are grappling with these difficulties, which has exacerbated the need to develop and distribute effective pedagogies for transforming and disseminating knowledge, skills, thinking, and values in the classroom. Thus, blended learning becomes a relevant pedagogy if integrated with the STEM criteria for maintaining students' focus on developing high order thinking skills (HOTS). As there are many different STEM criteria in the STEM context [2] and several factors need to be considered, selecting the appropriate multi-criteria STEM to be used in Mathematics is a crucial step for Mathematics educators. The selection of suitable STEM criteria, especially by expert teachers, is the key to helping other teachers succeed in the teaching and learning process [3]. The decision made by expert teachers is one of the practical suggestions to be implemented in their teaching and learning process. Therefore, a proper selection process for expert teachers is helpful for educators to achieve their goals.

Hence, this study applied the Fuzzy Analytical Hierarchy Process (AHP) which is one of the popular Multi-Criteria Decision Making techniques (MCDM). MCDM method can be implemented in making decisions with multiple criteria or objectives [4]. Using this technique, a decision-maker (DM) must identify, evaluate, or rank several qualifiable or non-qualifiable criteria depending on the weight of each criterion [5].