World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:18, No:01, 2024

An Early Intervention Framework for Supporting Students' Mathematical Development in the Transition to University STEM Programmes

Authors : Richard Harrison

Abstract : Developing competency in mathematics and related critical thinking skills is essential to the education of undergraduate students of Science, Technology, Engineering and Mathematics (STEM). Recently, the HE sector has been impacted by a seemingly widening disconnect between the mathematical competency of incoming first-year STEM students and their entrance qualification tariffs. Despite relatively high grades in A-Level Mathematics, students may initially lack fundamental skills in key areas such as algebraic manipulation and have limited capacity to apply problem solving strategies. Compounded by compensatory measures applied to entrance qualifications during the pandemic, there has been an associated decline in student performance on introductory university mathematics modules. In the UK, a number of online resources have been developed to help scaffold the transition to university mathematics. However, in general, these do not offer a structured learning journey focused on individual developmental needs, nor do they offer an experience coherent with the teaching and learning characteristics of the destination institution. In order to address some of these issues, a bespoke framework has been designed and implemented on our VLE in the Faculty of Engineering & Physical Sciences (FEPS) at the University of Surrey. Called the FEPS Maths Support Framework, it was conceived to scaffold the mathematical development of individuals prior to entering the university and during the early stages of their transition to undergraduate studies. More than 90% of our incoming STEM students voluntarily participate in the process. Students complete a set of initial diagnostic questions in the late summer. Based on their performance and feedback on these questions, they are subsequently guided to self-select specific mathematical topic areas for review using our proprietary resources. This further assists students in preparing for discipline related diagnostic tests. The framework helps to identify students who are mathematically weak and facilitates early intervention to support students according to their specific developmental needs. This paper presents a summary of results from a rich data set captured from the framework over a 3-year period. Quantitative data provides evidence that students have engaged and developed during the process. This is further supported by process evaluation feedback from the students. Ranked performance data associated with seven key mathematical topic areas and eight engineering and science discipline areas reveals interesting patterns which can be used to identify more generic relative capabilities of the discipline area cohorts. In turn, this facilitates evidence based management of the mathematical development of the new cohort, informing any associated adjustments to teaching and learning at a more holistic level. Evidence is presented establishing our framework as an effective early intervention strategy for addressing the sector-wide issue of supporting the mathematical development of STEM students transitioning to HE

Keywords : competency, development, intervention, scaffolding
Conference Title : ICMET 2024 : International Conference on Mathematics Education and Teachers
Conference Location : London, United Kingdom
Conference Dates : January 15-16, 2024