DYNAMIC COGNITIVE LOAD MANAGEMENT IN AI-DRIVEN CURRICULAR PATHWAYS: AN ALGORITHMIC APPROACH TO VYGOTSKY'S ZONE OF PROXIMAL DEVELOPMENT

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Abstract

The standard curriculums are used in many colleges results in a gap between one's potential and the actual abilities acquired by a student, which can lead to poor performance and burnout. In the paper, the authors present a solution called AI-based Personal Intelligent Learning Assistant (PILA) to provide the optimal personalized learning path based on a combination of 54 HND Computing modules. PILA applies Vygotsky's Zone Of Proximal Development in steering learning and teaching loads without actual cognition measurement or the physical condition of the student, and rather employing academic background of the student, VARK preference model, and targets to design a proper study plan. The development conducted with Design Science Research principle. The process of choosing can be defined as a limited optimization task including different conditions of the HND program being: compulsory units, options for specialization in nine professions, and minimum distribution of credit points required. The evaluation of candidates relates to the use of a multi-criteria evaluation method through the use of the formula: Total Rank = Prior Academic Score + VARK Match + Career Match. Using a combination of qualitative and quantitative methods aimed at finding out whether the system is effective, a mixed-research methodology was applied, which involved conducting qualitative semi-structured interviews and a quantitative research based on the survey employed with HND Computing students. The results obtained show that the system is sufficiently usable, has pedagogical relevance, and maintains the required constraints of the curriculum. As a conclusion, the applied methods enable the use of the theory of teaching zones as a method of streaming the curriculum. Moreover, the PILA model enables colleges to structure and enhance their information in student management as well as apply deep reinforcement learning methods with the help of different types of contextual bandits.

Keywords: Zone of Proximal Development, Personalized Intelligent Learning Assistant (PILA), Design Science Research, Deep Reinforcement Learning