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A new multi-level knowledge mastery assessment system for construction safety education: development and deployment at CityU

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Abstract:

The construction industry is one of the industries with the highest injuries due to its unique characteristics. One of the main reasons causing poor safety performance in the construction industry is the lack of sufficient knowledge in the construction workforce. Safety education is essential to improve the workforce's safety knowledge. Although many education courses/tools are offered on construction safety, those courses/tools failed to assess the mastery of safety knowledge/skills effectively. In this project, the project team aims to develop a new assessment system based on Bloom's Taxonomy with the scenario-enabled approach. First, a multi-level framework to assess the safety knowledge mastery will be developed, aiming to cover the different levels of learning objectives. Based on the proposed framework, the project team will analyze the characteristics of construction safety knowledge and categorized them into different levels for exploring what would be the appropriate assessment modules and types for them. A scenario-based method to assess the safety knowledge mastery is developed to facilitate the implementation in teaching. Next, a virtual reality-based prototype will be developed based on the proposed method, to include various types of questions (theory questions, hazard inspection questions, site safety analysis questions, etc.), to test the students' learning effectiveness of the construction safety knowledge. Current students in the ACE department will be invited to trial the prototype and provide data through experiment. In the experiment, a brief lecture on construction safety would be delivered to the student participants. Right after the lecture, the students will be asked to take a paper-based quiz or the scenario-based quiz in our developed prototype. The participants will be asked to fill in the NASA-TLX survey, report on the quiz effectiveness. T-test will be used for data analysis to test whether the proposed assessment framework and developed prototype outperform the traditional paper-based quiz. To get insights into the effectiveness of the proposed framework, participants will be interviewed to learn the student participants' experiences. If successful, the proposed assessment system could also be extended to other courses (especially whose knowledge can be applied in practice) to help them better evaluate the students' performance.