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## Learning Where to Discover Safety Hazards: Modelling eye-movement to train construction students' hazards-identification ability

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### **Abstract:**

The construction industry is hazardous due to the congested working environment and complexity (Figure 1). Hazard identification is the most frequently employed approach to preventing and reducing accidents on construction sites. However, hazard-identification is a complex task that requires knowledge of both regulations and experience, and the hazard identification experience is a kind of tacit knowledge that is difficult to be described explicitly in the text.

Researchers from other fields explored applying eye-movement modeling examples (EMME) to present experts' experiences in training materials. EMME is a video (a screenshot presented in figure 2) showing how experts perform a task, including experts' gaze points and voice which explicitly express experts' sensory process and cognitive process, respectively. It has been applied for education in several disciplines except the construction training, e.g., medical training and computer programming education. Previous findings show it can lead to better learning outcomes as well as changes to learners' eye-movement. Besides, according to the Cognitive Theory of Multimedia Learning, students apply both their visual and audio channels when learning from the EMME, so the EMME is possible to improve learning outcomes. As experts are supposed to allocate their attention in task-related areas, learners receive less redundant information during learning. Even though the EMME is beneficial in education, the construction industry has not explored EMME-related applications yet to improve the issues.

Hazards-identification can be regarded as a visual search task requiring experiences. It is risky and costly to bring students to real job sites to train them for hazard identification; therefore, this



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proposed project intends to explore the EMME application to enable students to experience the actual job site situations for improving the construction training. This project aims to explore the effectiveness of using EMME in training hazards-identification and develop a series of eyemovement modeling examples that effectively help construction students learn hazardsidentification.

Preliminary EMME will be shot in various construction locations first, and construction students will be invited to attend a pre-test to examine their original hazardsidentification ability. Then those students will be required to study the preliminary EMME. Next, they will join a post-test to assess their hazards-identification ability after learning from the examples. Finally, the examples will be modified based on participants's feedback and changes. Meantime, several experts from the construction industry and academia from universities will be invited to optimize the modified examples further. The final examples will be cut into multiple short videos according to the construction stages and locations.