VitalSource® **Learning Science**

Automatic Question Generation

We know that doing practice while reading, or learning by doing, increases learning gains for students (called the Doer Effect).

However, this practice is costly and time-consuming to create. To overcome this barrier, we developed automatically generated questions using artificial intelligence. We studied these questions by asking: are these automatically generated questions a viable option to scale learning by doing?

Here's what you need to know about the research:

1. By using artificial intelligence for automatic question generation, we can reduce the time and cost of developing formative practice questions, but it is critical that automatically generated (AG) questions have a level of quality on par with human-authored (HA) questions in order to be confident in their usage at scale.

2. When AG questions were compared to HA questions in the same courseware—used by the same students—we found that they were largely equivalent in engagement, difficulty, and persistence of use.

3. Engagement with the AG question types was similar to HA types. There was no indication that students found the AG question types problematic and chose to answer them less frequently.

4. There was no evidence that students preferred HA over AG questions. Rather, this research revealed that the recognition or recall format of a question had the greatest impact on initial engagement, and that difficulty had an impact on persistence.

5. Using automatically generated questions could enable students to benefit from the learn-by-doing methodology within a courseware environment where they otherwise would only have the original textbook.

R. Van Campenhout, J. S. Dittel, B. Jerome, and B. G. Johnson, "Transforming textbooks into learning by doing environments: an evaluation of textbook-based automatic question generation." In: Third Workshop on Intelligent Textbooks at the 22nd International Conference on Artificial Intelligence in Education, 2021.