論 文 の 要 旨

題　目　Retaining the Information Structure in the Open Information Structure Approach During Redesign of Learning Applications: Two Study Cases
（オープン情報構造アプローチを用いた学習アプリケーションの再設計における情報構造の保持：2 つの事例）

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The open information structure is a promising approach to design learning applications. One challenge with learning applications is redesigning the activity for new learning contexts. The open information structure, however, is based on interactable information structures. There is a possibility that the activity can be redesigned for the new contexts without changing the underlying information structure. This should make for a more effective redesign process.

This study explores redesigning learning applications that use the open information structure approach. It explores two case studies of two systems that were redesigned and analyses data from multiple experiments. The redesign process was successful and the applications appropriate for their new context. This study also provides insight on how it has affected learning gains and on how the redesigned portions affect how the application should be used.

In one case an arithmetic study system was redesigned for Kindergarten, where not all students can read. In the second case a concept map building application was redesigned for contexts where long activity times and high cognitive load are undesirable. Multiple experiments are done using the systems to answer the research questions. Kindergarten students were able to use the system well, showing signs of not trying to game the system.

This study shows new advantages of the open information structure approach. It informs designers that they can keep the underlying information approach when redesigning the applications. It gave an example of adapting an application from text to images. It also gives information on which closed concept map tools are better used for each context.

In future work for the concept map tool, new interfaces that isolate layout management and spatial separation will be developed. The challenge of developing these interfaces lies in introducing these elements without changing other aspects of the interface. Another matter for future study is analyzing differences in learning gains without the use of feedback mechanisms. Finally, whether the time saved by reducing the cognitive load could be better spent in other activities, such as having students make associations between the text and the map, will also be investigated. This could provide further gains in both comprehension and retention. As for the future work in the arithmetic tool, the next step in this research is to allow students to create the story pieces themselves. The objective would be to make children think deeply about each quantity separately.