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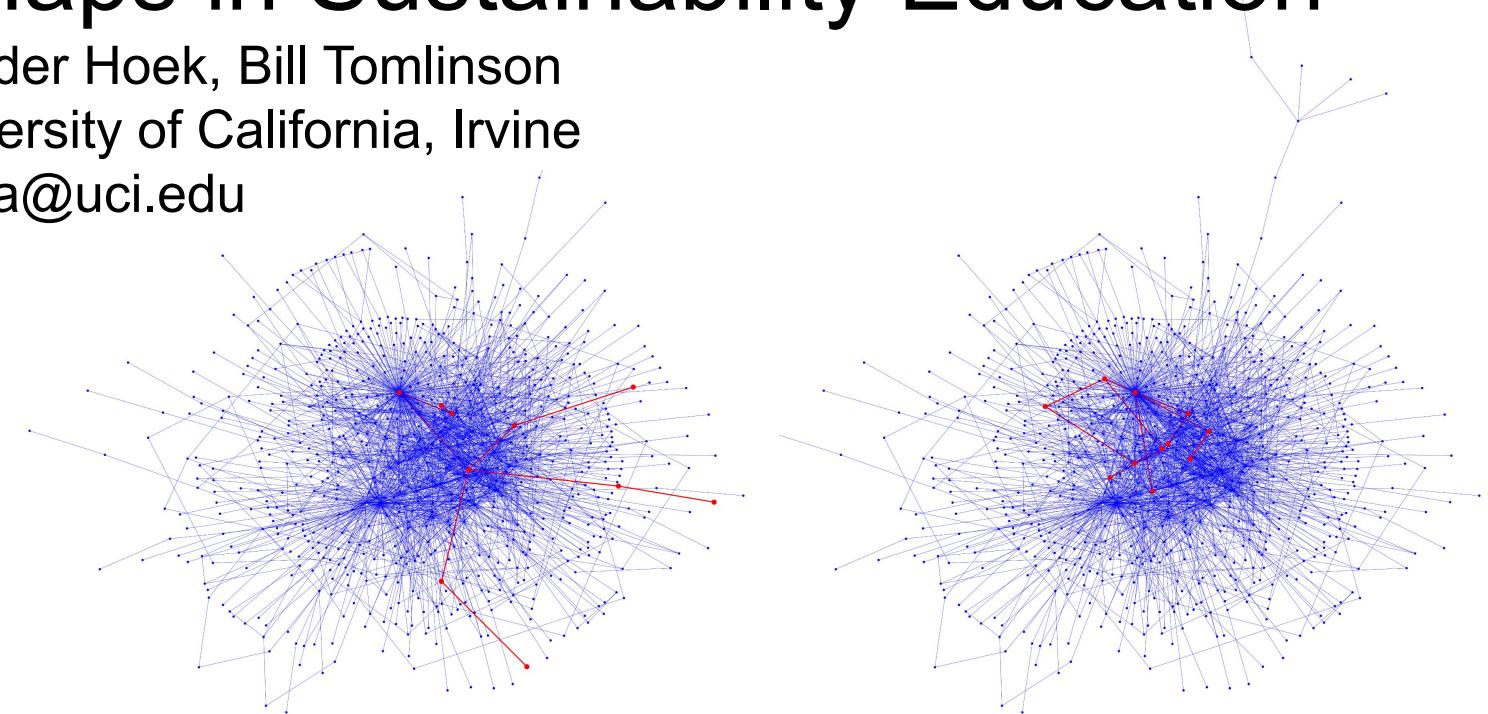
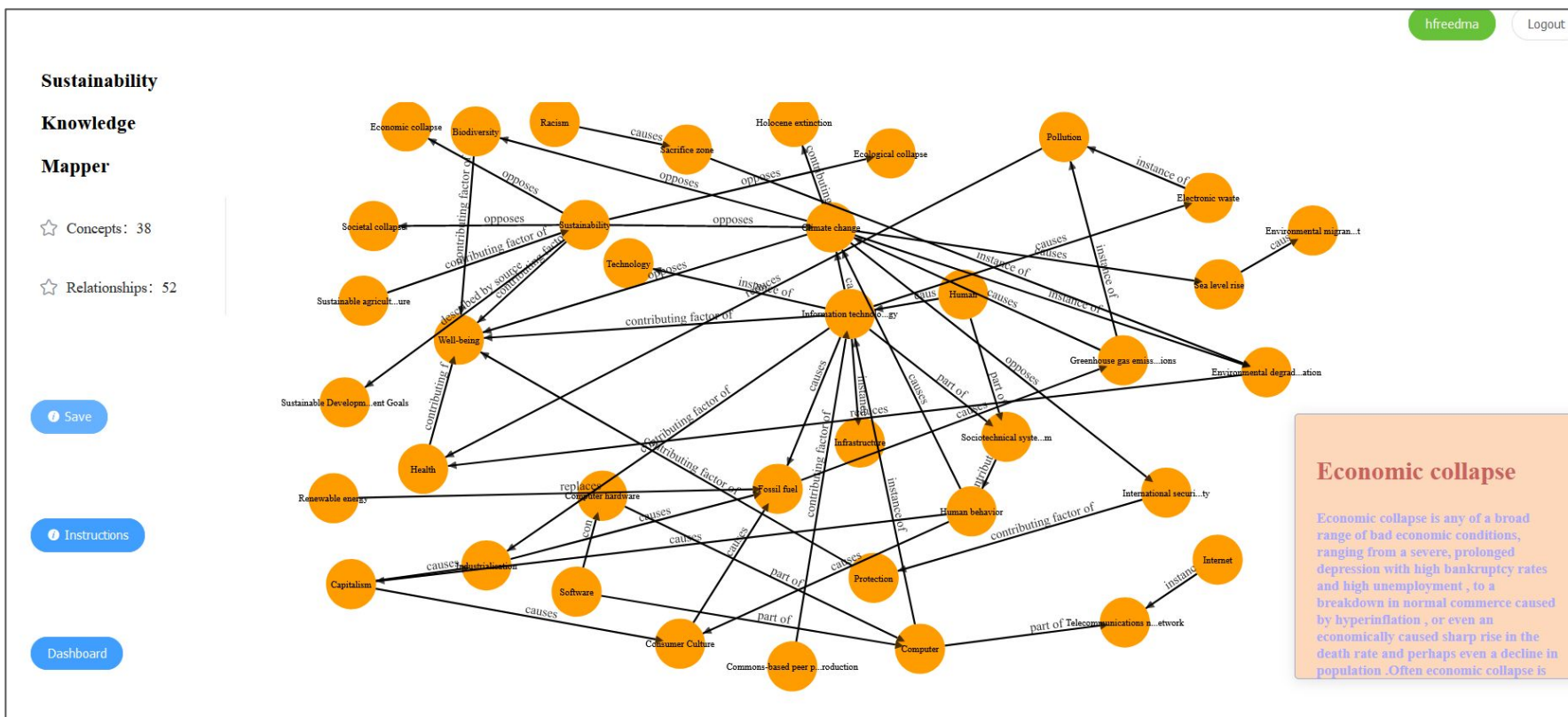
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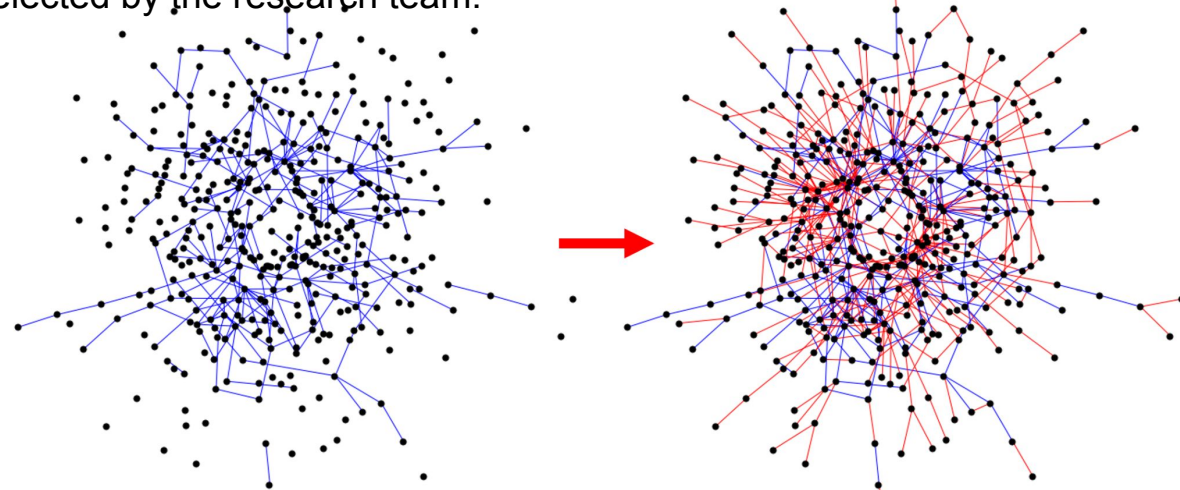
Connected Learning with Cognitive Maps in Sustainability Education

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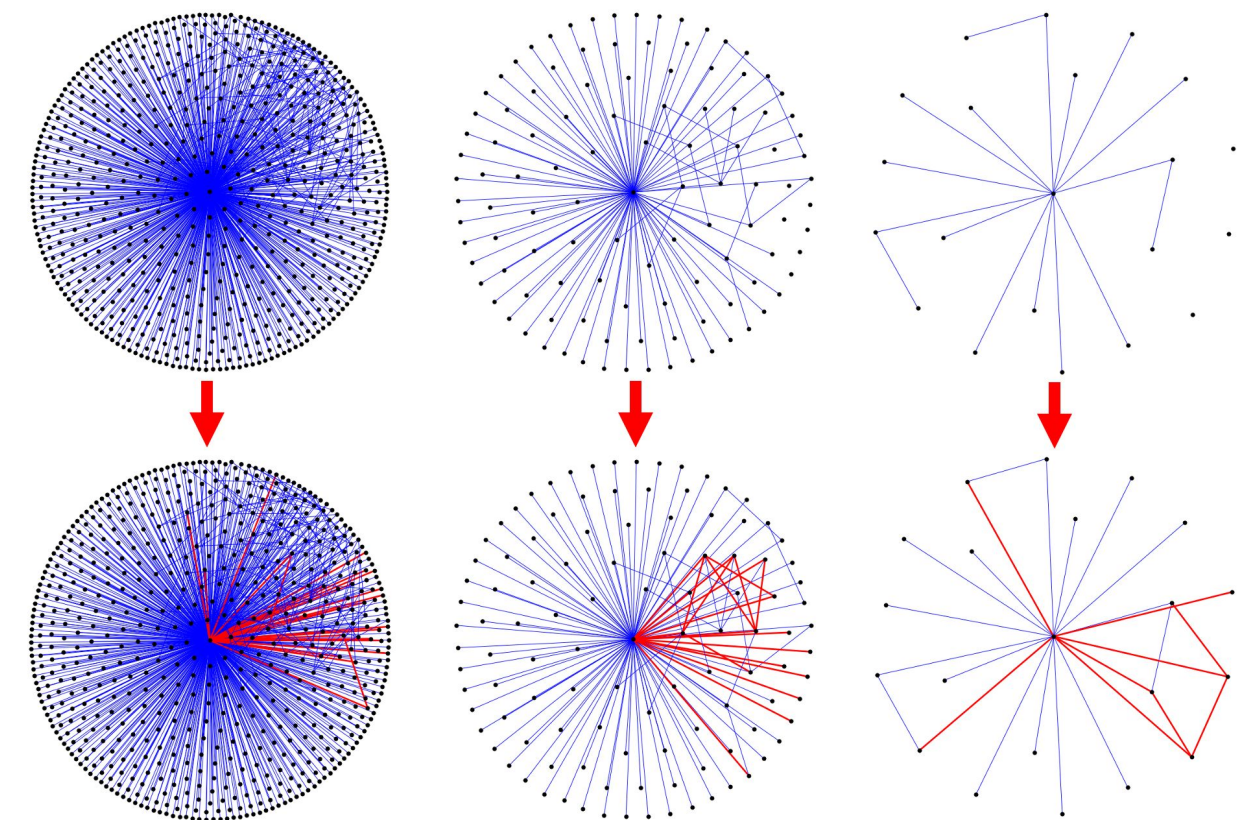


Step 3: Network analysis can help to automatically identify high-quality student networks based on centrality. The red lines in each of the above graph show the contributions of an individual student to the automatically constructed aggregate network of all the individual student networks. On the left, the student's contributions are peripheral, whereas on the right they are more central. We find that students that created networks located more centrally in the aggregate network are more likely to have Wikidata-quality content in their networks.

Step 1: Undergraduate students use web tool to construct concept networks about sustainability. The orange circles represent sustainability concepts and the black lines represent the relationships between them. Students are free to use any concept present in Wikidata, along with a list of 20 possible relationships selected by the research team.



Step 2: Student networks are vetted by an expert and contributed to Wikidata. This figure shows Wikidata concepts to which the workflow contributed at least one link. The left network displays the concepts to which statements were contributed, and the pre-existing links among them. The right network includes the same concepts, with both pre-existing links (blue) and those added by the workflow (red). This figure demonstrates that the contributions via the research described here led to a non-trivial enhancement of this region of Wikidata.



Results By-Concept: This figure shows pairs of charts for three concepts in Wikidata, with the top row showing pre-existing links between each concept and related concepts, and the bottom row showing the pre-existing links (blue) plus the links added by the workflow (red). The two networks at left show *sustainability*, the two center networks show *pollution*, and the two at right show *urban agriculture*.