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Temporal Trajectories of Epistemic Views by University Students in a Knowledge-Building Learning Environment

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Abstract: The epistemic view is a crucial factor in leading learners to more productive learning in knowledge-building practice. Previous studies revealed that students holding Popper's World 3 view of learning outperformed those holding the ordinary World 2 view. This study further examined the temporal trajectories of university students' epistemic views in a knowledge-building environment. The results suggested they were divided into three groups depending on the trajectories of their epistemic scores over a knowledge-building course.

Background and research purpose

In knowledge-building practices, learners are encouraged to engage in progressive inquiries for their authentic problems through knowledge-building discourse (Scardamalia & Bereiter, 2021). To support learners' engagement in such inquiries, the Knowledge Forum, a CSCL technology, has been used in many design-based studies worldwide (Chen & Hong, 2016). One recent research development proposed a new perspective for evaluating university students' competence with knowledge-building practice and their epistemic views of learning. In their case study, Hong et al. (2016) demonstrated a strong connection between the type of students' engagement in their progressive inquiries and the development of their epistemic views of learning. Furthermore, students could develop more sophisticated epistemic views of learning when they were more appropriately engaged in the knowledge-building practice designed in the online learning environment. We designed a project-based learning for university students and examined the effectiveness to facilitate students' development of their epistemic views through a semester-long knowledge-building practice.

Method

Learning context

A total of 74 first-year university students participated in this study by taking a knowledge-building course in which their task was to propose new happiness indices based on open data on the web. We designed the knowledge-building learning environment with two design elements. First, we designed the participatory structure of students' learning activities using knowledge-constructive jigsaw instruction (Miyake & Kirschner, 2014). Second, we used the Knowledge Forum as a digital space for students to share their ideas and reflections to support their idea improvement.

They started by watching TED talks about happiness by four scholars to think of their definition of happiness within two weeks (Phase 1). In the next stage (three weeks), they engaged in expert group activities in jigsaw instruction. One or two members from original groups were gathered as expert groups in which students examined different aspects of a popular happiness index developed by a Japanese think tank (Phase 2). In the final stage (seven weeks), students returned to their original groups and engaged in their collaborative inquiry in jigsaw group activities (Phase 3). Every week, they were instructed to report their progress compared with their previous weeks in the Knowledge Forum and their reflection notes as build-on notes to their group notes.

Collected data and analyses

We used students' reflection notes reported every week on the Knowledge Forum. Their reflections were evaluated by the coding scheme of epistemic views of learning in a previous study (Hong et al., 2016). Hong et al. (2016) developed their scheme with six codes based on Popper's 3-World epistemology (Popper, 1972). A total of three codes represented World 2 views of their learning, such as "abstract concepts," "reflections," and "personal knowledge growth." The other three codes represented World 3 views, such as "concrete objects," "interaction with the world," and "collaborative endeavor" (Hong et al., 2016). We first identified sentences representing codes in their reflection notes and calculated each student's epistemic view scores of World 2 and World 3 (from 0 to 3) by adding 1 for the presence of sentences representing a code (Cohen's k =.92).

Based on the epistemic-view score data, we conducted two analyses. First, a clustering analysis of students' epistemic scores of Worlds 2 and 3 over three learning phases identified groups representing trajectory patterns of epistemic views over the learning process. Second, to examine differences in the temporal trajectories

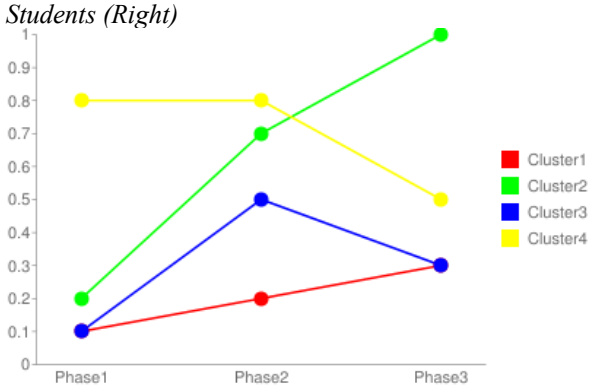
among the four found clusters, we conducted 4 (Clusters) X 3 (Phases) ANOVAs on the epistemic view scores (Worlds 2 and 3).

Results and discussion

In the cluster analysis, we identified four clusters (left of Figure 1). Further 4 (Clusters) X 3 (Phases) ANOVAs on the epistemic view scores (Worlds 2 and 3) revealed significant differences in the trajectory of their epistemic view scores. In the analysis of World 2 view scores, we found that, although their initial scores differed, all four clusters of students had the same characteristics of decreasing their scores. Furthermore, in the analysis of World 3 view scores, two main effects and the interaction were significant, $F(3,70) = 22.630$, $p < .01$, *partial* $\eta^2 = .503$, *power* = 1.000 for the effect of Clusters, $F(2,140) = 12.664$, $p < .01$, *partial* $\eta^2 = .153$, *power* = 1.000 for the effect of Phases, and $F(6,140) = 12.792$, $p < .01$, *partial* $\eta^2 = .354$, *power* = 1.000 for the interaction effect (Figure 1). The results of multiple comparisons suggested that the four clusters could be roughly divided into three patterns. Clusters 1 (n = 10) and 2 (n = 32) were identified as the sustainable increasing group. Cluster 3 (n = 11) was identified as the "increased and then decreased" group. Finally, Cluster 4 (n = 21) was identified as the non-sustainable group. Thus, in the knowledge-building environment designed herein, the design elements influenced the temporal change in students' epistemic views in three different ways. The most critical phase transition should be from phase 2 to 3. In the phase 2, students examined the same piece of knowledge within their groups in the expert group activities. Then, they came back to their original jigsaw groups where they shared different pieces of knowledge to develop new ideas of happiness indices as products. Around half of the students (n = 32) had difficulties in sustaining their epistemic views of knowledge creation in Phase 3 where they were engaged in the most intensive exchange in their ideas. Further detailed analyses of students' activities are necessary to examine how the instructional design in Phase 2 supported them in increasing or sustaining their World 3 views and how the instructional design in Phase 3 influenced them in the opposite ways.

Figure 1

Dendrogram of Clustering Analysis (Left) and Temporary Transition of World 3 View Scores by Four Clusters of Students (Right)



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Acknowledgments

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