STUDENTS' BEHAVIORIAL ENGAGEMENT PATTERNS IN A WEB-BASED SCIENCE INQUIRY LEARNING ENVIRONMENT

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THEME

Approaches and methodologies for STEM education research

BACKGROUND AND AIMS

Web-based inquiry learning has received more attention in formal science learning in recent years. Learning engagement is of vital importance in such learning environments. Log data has been widely used to detect the engagement of students in higher education, such as behavioral engagement in MOOC, LMS, etc. This study aimed to capture the transformation of behavioral engagement patterns of 5th grade students, through analyzing the features extracted from the log data collected in a Web-based Inquiry Science Environment (WISE).

The following research questions were addressed: a) Can students' behavioral engagement patterns and meaningful transition paths over time be distinguished based on log data in WISE? b) Is there any association between students' transition paths of behavioral engagement and learning gains in their inquiry performance?

METHODOLOGY OR PROCESS(ES) UNDERTAKEN

A total of 129 5th grade students from 3 classes in one primary school in northern China participated in two sessions with virtue science inquiry experiments implemented in WISE. The time intervals between two sessions varied in 2 or 3 days. Latent transition analysis (LTA) was conducted to explore types of learners' behavioral engagement patterns and transition paths for the two time points. Indicators of latent classes were features distilled from log data. Features were extracted from three learning stages, designing experiments, conducting experiments, and actively navigating through different learning steps. Learning gains were measured by the improvement in pre- and post- science literacy tests. One-way ANOVA were conducted to compare learning gains among distinct behavioral engagement transition paths.

RESULTS AND CONCLUSIONS

Two classes of behavioral engagement patterns, labeled as deep engagement and disengagement, were determined based on model parsimony, interpretability, and statistical criteria. Deep engaged learners conducted significantly more trials than disengaged learners, as well as correct trials. Deep engaged learners also tested more experiment conditions. All these behaviors indicated that they have better thoughts about how to generate conclusions based on the experiments. Four types of transition paths of behavioral engagement were obtained: positive retainers, negative retainers, effective learners, and retrograde learners. Learners with distinct transition paths of behavioral engagement differed significantly in their learning gains. Positive learners improved most in learning gains, followed successively by effective learners, retrograde learners, and negative learners. However, the significant discrepancy of learning gains was only found between positive learners and negative learners.

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