Patterns of Identity Exploration Among High School Students in a STEM Course Augmented by a Virtual Learning Environment

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Abstract: This work presents the overall findings from three iterations of a STEM course *Virtual City Planning.* VCP leveraged a virtual learning environment and supported in-class curricula to facilitate students learning as identity exploration by taking roles of environmental scientists. Course design was informed by Projective Reflection (PR), a theoretical and methodological framework that conceptualizes learning as identity change in digital and non-digital environments. Numeric and text data from the three sessions were collected from 54 students and analyzed using Quantitative Ethnography (QE) techniques to identify patterns of identity exploration enacted over time. Epistemic Network Analysis (ENA) was used as a QE technique to visualize the relationships between cognitive and affective PR constructs in each of the three student groups over time. Findings suggested that regardless of design changes in VLEs, there is opportunities of integrative identity exploration for all students.

Keywords: Identity Exploration, Virtual Learning Environments, Quantitative Ethnography, Epistemic Network Analysis

Introduction

Research on the intersection of identity exploration and virtual learning environments is an emerging field, and the need for robust conceptual and design frameworks has been emphasized (DeVane, 2010). In addition, there is a need for research methods that can complement the theoretical aspects of identity exploration and capture change in data-rich, play-based environments such as VLEs (Wise & Shaffer, 2015). In this work, Projective Reflection (PR) (Foster, 2014) theory of identity exploration has been used as a theoretical framework to assess group change at three time points in classroom experiences: a) students' starting selves at the beginning of the courses, b) student exploration of role-specific possible selves throughout the experience, and c) students' new selves at the end of the course. To address the methodological aspect, QE techniques (Shaffer, 2017) were used as a methodological approach to capture patterns of identity change in discourse (i.e. what students said and did) for visual interpretation of networks.

This research was conducted as part of an NSF CAREER grant, in which the *Philadelphia Land Science (PLS)* was offered as part of the *Virtual City Planning* Course in a local science museum. *PLS* is a play-based virtual learning environment that was supported by in-class activities that include the features of informal learning environments (Green, Facer et al. 2005). *PLS* provided opportunities for identity exploration in environmental science and urban planning roles for high school students. Qualitative and quantitative data were collected from the three courses to answer the following research question: *What are the patterns of identity exploration experience among high school freshman students participating in a virtual learning environment course?*

Methods

The combination of a VLE and supportive in-class activities was implemented across three chronological iterations. *VCP1* featured the use of *PLS* with a few in-class curricular activities, *VCP2* featured balanced use of both *PLS* and curricular activities, and *VCP3* featured analogous in-class curricular activities only. These iterations were offered in one year; each was refined from the previous iteration based on design-based research tenets (Cobb, Confrey et al. 2003). Data sources included in-game logged data, research memos, pre-post interview questions, written and visual artifacts created both in-game and during individual/group curricular, reflection and discussion activities. Once collected, data was organized chronologically based on the phases of PR to trace changes from the groups' Starting selves, through the Exploration of role Possible Selves, to their New Selves at the end of each experience. This poster presents the overall findings for all three implementations of *Virtual City Planning* (*VCP1-VCP3*). Qualitative thematic analysis and Epistemic Network Analysis (ENA) are two methods of data analysis that will be discussed in this poster.

Findings

To answer the research question, we compared students' thematic analysis results with their ENA visuals and found three themes which will be explained below:

Switching back to initial interests and perceptions

The similarity of ENA patterns in Starting Self and New Self phases aligned with findings from the thematic analysis, both of which indicated that the students reverted to initial patterns of identity exploration with regards to their interest, knowledge, and self-perceptions and self-definitions. Generally, the students' knowledge shifted from primarily foundational knowledge representations to more meta-knowledge understandings of city issues when they were designing solutions as urban planners. Their interests shifted from a focus on personal preferences to reflections on the interests of the community, including an emphasis on resolving issues of the city. Their self-perceptions and self-definitions developed as self-related perceptions developed in *VCP* by maintaining initial perceptions of who they might want to become (sessions 2 and 3). Students usually reverted to their "starting self" characteristics for interest, knowledge, self-perception and self-definition. However, in the projection and reflection, this return in their "starting self" initial interest, knowledge, self-perception and self-definition was recorded with a deeper understanding of themselves. As such, this reverting process does not allow the "new self" to be completely similar to "starting self".

Identity exploration as a variable of time

As the patterns of change are shown in similar ways for both the thematic analysis results and ENA visuals, the concept of time becomes more important. The findings suggest that student changes in PR constructs are time dependent. Not only did time affect patterns of student change, but also students' gains manifested in similar ways over the course of the sessions.

Integration in Virtual Learning Environments

The results of both thematic and ENA analysis confirmed the integrative nature of identity exploration in all three sessions of *VCP* even though the combinations of VLE experiences and supportive in-class activities differed by session. In all sessions' phases (except in session 3 exploring role possible self), the connection between the knowledge construct and the self-perception and self-definition construct remained constant. The qualitative data helped to illustrate how and why students' self-perception and self-definition were consistently linked to knowledge and interest in the ENA models, indicating integration. In addition, the ENA visuals demonstrate that when the number of in-class activities increased in *VCP2* and *VCP3*, regardless of demographic features, the integration of PR constructs manifested in more similar trajectories across the two sessions. In both sessions, students started and finished similarly and most integration happened during the Exploring role Possible Selves phase (middle 2-5 weeks).

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