

Recommender System to Support Brokering of Youth Learning Opportunities

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Abstract—Recent research examining learning in informal environments reflects a growing recognition of the important role adults play as learning brokers by identifying and orchestrating connections to learning opportunities such as access to people, spaces, programs, and information sources. In order to broker learning, educators need to have knowledge about youth as well as potential opportunities. This position paper argues for the design and development of a recommender system to support educators in brokering learning that makes use of log data from an online social learning network.

I. INTRODUCTION

Recent research examining learning in informal environments reflects a growing recognition of the important role adults play as learning brokers by identifying and orchestrating connections to learning opportunities such as access to people, spaces, programs, and information sources [1], [2], [3]. Part of educators' capacity to effectively broker learning draws from the quality of social relationships with youth, in which trust and knowledge about youth interests and goals develop [3], [4]. For adult educators (e.g., teachers, mentors) in many formal and informal environments, however, developing this deep understanding and knowledge about individual youth can be difficult, due to factors such as finite time and high youth-to-adult ratios.

As research is emerging on how brokering works within and across settings [7], we aim to address the problem of how educators develop knowledge about individual youth that can support more equitable and perhaps more efficient brokering, suggesting the potential of an educational recommender system to address this issue. We seek to take advantage of data gathered from use logs from an online social learning network to help adult educators broker learning opportunities for youth. These data sources can be used to model student interests, skills, and goals. A recommender system that can exploit these models can greatly assist in helping educators connect youth to resources and people that can extend their interests and deepen learning.

II. BROKERING USING KNOWLEDGE OF YOUTH

The practice of connecting youth to opportunities that may have otherwise been inaccessible (i.e., brokering) requires that

educators possess knowledge that will enable them to effectively broker learning opportunities to students. Researchers who are examining brokering have identified types of knowledge that can inform educators' capacity to broker learning opportunities. These include knowledge of youth interests, goals, and social connections (e.g., mentors, collaborative peers, and gatekeepers) [3], as well as knowledge of learning opportunities involving experiences (e.g., programs, events, and internships), institutions (e.g., colleges, companies, and organizations), and information sources (e.g., websites, books, and how-to guides) that are relevant to youth interests [3]. Further, educators may also need to be aware of students' attitudes and tendencies toward seeking help, and social connections (i.e., their network and help-seeking orientations) as well as the appropriateness of a given opportunity based on a student's current skill set [3]. Thus, effective brokering practices require a broad spectrum of knowledge about youth interests, goals, attitudes, and capacities in addition to knowledge of learning opportunities. In this work, we aim to enhance educators' ability to efficiently and equitably broker learning for youth. To do this, we explore how a recommender system can help alleviate the effort required for educators to build this type of knowledge, which is typically accomplished through individual and personal interactions with youth and their work products.

III. DATA AND LOG CODING METHODS

A. Data

iRemix is an online social learning platform [1], which has an interface and functionality similar to popular online social network communities. Youth and educators can create profile pages, link to peers, and share and critique work through blogs, forums, and debates. It is intended to support the development of 21st century learners through production, reflection, critique, and revision. While the system is meant to be youth-driven and reflect youth interests, educators can post challenges to prompt activities, view posted digital artifacts, and respond to youth work with rubric ratings, comments, or reaction tags. In this work, we use data from one middle school ELA (English Language Arts) teacher and his 56 students and their use of iRemix over three years. Each observation in the data is a web log, which records various actions performed. Other data

collected included student surveys and interviews with students and educators.

B. Coding Framework

We use a coding framework to make sense of youth and educator actions revealed in the iRemix use logs. Based on the log data, actors, actions and recipients are derived, which are then processed by a set of rules to generate the coded learning interaction dataset [6]. For youth actions, we attend to three main themes: *creative production*, *self-directed learning* and *social learning* [6], [5]. *Creative production* involves developing identity as a creator, creating media, and revising work. *Self-directed learning* involves using online resources, monitoring one's progress, and seeking support and learning opportunities. *Social learning* involves communicating with others and observing the work of peers. For actions made by educators we code a number of learning support roles reflected in the action, such as *Audience*, *Encourager*, *Learning Broker*, *Instructor*, and *Evaluator* [6].

IV. INFORMING A BROKERING RECOMMENDER SYSTEM

We envision the development of a recommender system, integrated into the iRemix platform and drawing upon iRemix data, that helps educators identify brokering opportunities for youth. Using the approaches described below, such a recommender system can help educators efficiently learn about youth they interact with in ways that better enable them to broker connections to people, resources, and opportunities.

A. Understanding Youth Social Connections

As a support for brokering, social network analysis of coded user actions can reveal information about youth social connections; for example, by examining how individual youth comment on and view the work of others. By looking at coded educator actions we can also understand specific ways educators have interacted with youth (or with the artifacts they produced). Thus, social network analysis can be performed to identify communities within the class, perhaps recommending to the educator particular students to draw upon as connectors or helpers. This type of recommendation addresses efficiency by making it easier for educators to make brokering moves without the need to develop that knowledge solely through interactions in the face-to-face environment or by normal online interactions.

B. Understanding Youth Interests

As reflected in the use logs, we can learn about the expertise and prior experience of youth by looking at records of achievements earned (such as badges) or quality ratings on posted artifacts. We can infer interests by applying data mining techniques to the online contributions of youth (e.g., types of artifacts or comments posted, types of resources accessed). A recommender system can help educators use information about youth interests to make decisions about grouping students depending on particular goals, such as creating groups with similar interests or groups with different levels of skills. Helping educators to more quickly understand youth interests supports more efficient brokering by making it easier to facilitate connections to opportunities that extend or broaden identified interests.

C. Understanding Youth Online Activity

A brokering recommendation system can also be built on students' online activity patterns. In order to explore the different usage patterns of students in the online social learning network, *k*-means clustering was applied on the log data extracted from iRemix, where students were represented as a vector over the space of student action codes. We identified four clusters identifying several motifs of activity: (1) students whose activity oriented around creative production, which reflect editing and completing work, (2) students whose activity focused on social learning actions such as viewing, commenting on work, and personalizing their profile, (3) exploration oriented students who exhibited some of the activities that other groups did not, but were not heavily invested in one type of activity, and (4) students with relatively low online participation and contributions. In combination with information about youth interests, skills, and their roles in social networks, online activity data can be used to make visible how well youth are engaged in production activities, social participation, interest exploration, and learning opportunities. A recommender system that makes use of this information can help address equity by helping educators identify individual students who are in need of particular supports, as well as to build and shape the learning community as a whole.

V. CONCLUSION

In traditional learning environments, educators learn about their students' interests, skills, and goals in the classroom through a time- and effort-intensive process of interacting with individuals and their work products over time. However, in order to broker effectively, educators must have detailed knowledge about youth. While building trust, relationships, and knowledge of youth takes time, we have argued that student participation in an online social learning network can provide several sources of data which can be used to support that process by building knowledge about youth that is needed to efficiently and equitably broker learning opportunities.

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