



Teacher, Student and Domain Based  
Educational Recommender System for Assessing  
Student's Preferences on Multiple  
Recommendation Sources

---

Hasan Abu Rasheed, Christian Weber, Scott Harrison,  
Johannes Zenkert and Madjid Fathi

EasyChair preprints are intended for rapid  
dissemination of research results and are  
integrated with the rest of EasyChair.

July 6, 2019

## **Teacher, Student and Domain Based Educational Recommender System for Assessing Student's Preferences on Multiple Recommendation Sources**

*Hasan Abu Rasheed, Christian Weber, Scott Harrison, Johannes Zenkert, Madjid Fathi*  
*University of Siegen, Institute of Knowledge Based Systems & Knowledge Management*  
*(Germany)*

### **Indicate your track:**

(Please mark the track that is (most) relevant to your abstract. You can select more than one track)

1. Academic research: comprehensive evaluations of recent innovations in learning and student analytics approaches.
2. Practitioner's sessions: examples of Learning Analytics (LA) approaches. Please indicate which of the following sessions best matches your paper:
  - a. LA implementation
  - b. LA in education**
  - c. LA in the job market

Maximum length: 750 words

### **Purpose**

In our modern world, the preferences that learners have regarding the source of information they are receiving can be overwhelming, since the access to information and learning materials is almost unlimited due to the wide spread of online courses and learning resources. In the educational environment, this implies the need to offer guidance to the student in terms of suggesting suitable materials to be studied along their learning path, and also the need to personalize these suggestions to correspond to each individual student's preferences and learning requirements [1]. Such recommendations, in formal education, have multiple sources, such as the teacher, other students, and the domain of knowledge itself. In this research, the balance between these different recommendation sources, as well as the change of student dependency upon each one of them is investigated. An experimental procedure is designed and proposed in order to answer the question: How can different recommendation approaches and perspectives be fused and balanced in order to provide students with suitable and personalized recommendations on which topics to learn in a specific domain of learning. Since this experimental environment depends considerably on the feedback gained from students, the

research is also intended to evaluate the role of conversational procedures as a mean of interacting with the user. Thus, a conversational voice-based engine is designed to provide a human-like interaction, which can help in validating the amount of feedback provided, in contrast to traditional click-based rating interfaces.

## **Design**

The experimental environment consists of a hybrid educational recommender system (ERS) and a voice-based conversational engine. It outlines the implementation, analysis and comparison of different recommendation sources. The hybrid recommender consists of three parts, as shown in Fig.1:

- 1- Teacher-based recommender: representing the expert's perspective in the educational environment. The teacher is expected to suggest to students a specific topic to be studied based on the previous topics in the course and other learning parameters. For this reason, the teacher-based recommender is implemented as a content-based (CB) recommendation algorithm. CB recommenders depend on the previous history of user's preferences in order to suggest to them new suitable topics [2].
- 2- Student-based recommender: representing the influence of students, studying the same course, on each other when choosing new topics to study next. This collaboration between students is represented in this research as collaborative-filtering (CF) recommendation algorithm. CF recommenders search for similarities between users, and then recommend to one particular user topics that other similar users have preferred previously [2].
- 3- Domain-based recommender: This part represents the influence of interlinks and dependencies between topics within one domain of knowledge. The network that connects different topics in one course can provide students with multiple directions to take when moving from one topic to another [3]. In this research, a college level course has been analyzed and modeled to create this recommender.

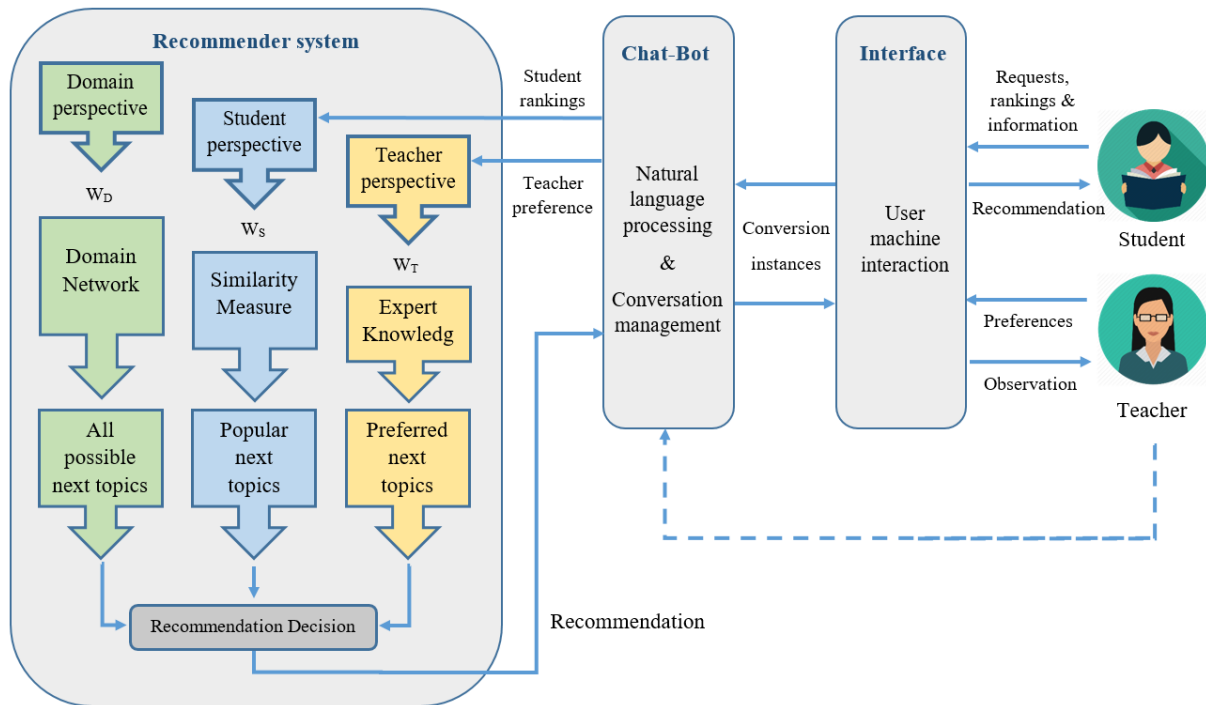


Figure 1 Overall System Structure of the ERS

The hybrid recommender interacts with the user through a voice-based conversational engine. It utilizes Amazon Alexa skills in order to offer students a friendly and engaging conversation. An example is illustrated in Fig.2. The spoken interaction can enable validating the role of conversational engines in encouraging users to provide more feedback, which in turn enhances the quality of recommendations [4].

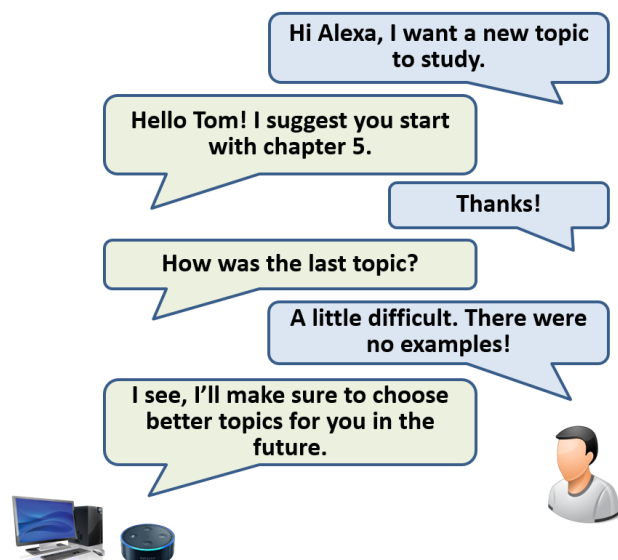


Figure 2 The Conversational Interface

## **Results**

The outcome of this research is an experimental platform that can help in validating multiple source recommendations in the educational context, the change in student's preference of a particular source with time, as well as the influence of the interaction means on the amount of feedback received from users. The experiment platform takes the form an Amazon Alexa skill that interfaces a back-end recommender algorithm. A long term test is intended to be performed for a full semester period of time. The targeted feedback includes user ratings of topics, user choice of recommendation sources and a final survey of the overall user experience. Currently, a short term test on the proposed system is conducted for usability and performance assessment. The test targets students in the University of Siegen.

## **Implications**

In this research, an experimental approach is proposed to test educational hybrid recommender systems. The data to be collected from the users is intended to help tracking the preferences of a student on these different sources, in order to evaluate the hypothesis this preferences will change with recommendation sources and time. The system may also allow the assessment of student engagement based on the amount of feedback received through the conversational engine.

## **Resources**

- [1] S. Benhamdi, A. Babouri, and R. Chiky, "Personalized recommender system for e-Learning environment." *Education and Information Technologies*, vol. 22, pp. 1455–1477, 2017.
- [2] F. Ricci et al., "Recommender Systems: Introduction and Challenges" in *Recommender Systems Handbook* (F.Ricci, L. Rokach, B. Shapira), pp. 01-34, Boston, MA: Springer, 2015.
- [3] J.K., Tarus, Z. Niu, and G. Mustafa, "Knowledge-based recommendation: a review of ontology-based recommender systems for e-learning," *Artificial Intelligence Review*, vol. 47, no. 1, pp. 1-28, 2017.
- [4] O. C. Santos, and J. G. Boticario, ""Practical guidelines for designing and evaluating educationally oriented recommendations." *Computers & Education*, vol. 81, pp. 354-374, 2015.