THE UNIVERSITY OF WARWICK

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provides questions and answers related to learning topics, and provides recommendations of questions, learning topics, expert peer and social interaction tools for practices and discussions, and collaborations.

III. SOCIAL INTERACTION FEATURES IN TOPOLOR

This paper focuses on the three social interaction tools (shown in Fig. 1 and Table I): *Status Tool* is used to share learning statuses. Learners can favor and comment on each other's statuses; *Messaging Tool* is used to send private messages to others; *Q&A tool* is used to ask and answer questions. Learners can also use *Q&A tool* for discussions.
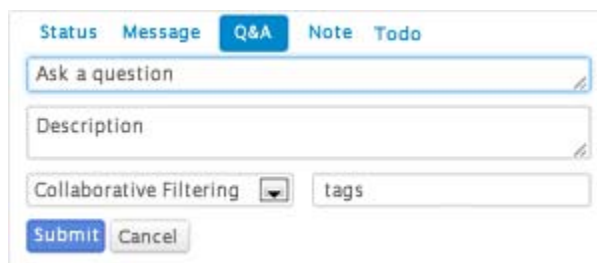

Figure 1. Social interaction toolset

IV. EVALUATION OF SOCIAL INTERACTION FEATURES

The experimental case study was conducted with the help of 21 students from the Department of Computer Science at the University of Warwick, who were registered for a 4th year MSc level module "Dynamic Web-Based Systems", and a lecturer led this module. The students were asked to learn from the system a lesson on "Collaborative Filtering" during a 2-hour learning session. 18 social interaction features used by the students were identified, listed in Table I.

TABLE I.   SOCIAL INTERACTION FEATURES USED BY THE STUDENTS

Status	a. post a status; b. edit a status; c. delete a status; d. comment on a status; e. favorite a status; f. share a status;
Message	g. send a message; h. reply to a message;
Q&A	i. ask a question; j. edit a question; k. delete a question; l. answer a question; m. edit an answer; n. delete an answer; o. share a question; p. favorite a question; q. add a tag to a question; r. edit tags of a question.

After the learning session, the students were asked to fill in an optional questionnaire to measure the *usefulness* and *ease of use* of the social interaction features. The students had to select one of the five responses for *usefulness* and *ease of use*, respectively. *Usefulness*: 1) very useless; 2)

Abstract—here we present a case study that analyses the social interaction features in Topolor, an adaptive personalized social e-learning system. This paper focuses on the evaluation of the perceived *usefulness* and *usability*. The results show a considerably high satisfaction of the students. We discuss the evaluation results and outline the plan for improvement.

Keywords—social learning; e-learning; social interaction; evaluation; adaptive educational hypermeida

I. INTRODUCTION

Topolor [1] is an e-learning system with adaptation and social interaction features. It has been used as an online learning environment for teaching postgraduate modules at the Department of Computer Science, University of Warwick. It was designed based on the hypothesis that *extensive social features, personalized recommendations and Facebook-like appearance of a system, would make the environment more familiar to learners, positively affecting usability, as well as learning*. To isolate research variables, this paper focuses exclusively on studying the *usefulness* and *ease of use* of the social interaction features in Topolor.

II. THE TOPOLOR SYSTEM

Topolor was built on Yii[1], a PHP framework, and Bootstrap[2], a user interface framework. It is hosted on Github[3] for version control and open resource sharing. The first version of Topolor[4] has been opened to public with the expectation that a larger cohort of learners could use it, so that in the near future, we could collect more feedback, usage data and suggestions for further study and implementation.

Topolor mainly consists of 3 sub-systems, i.e., *Topolor-Home*, *Module Centre* and *Q&A Centre*. Each of them contains adaptive and social interaction features that help enhance learning experience. *Topolor-Home* provides a chronological list of the learning statuses posted by students. It also provides interaction tools that encourage informal communication and collaboration, such as commenting on, sharing and favoring of posted statuses; *Module Centre* maintains online modules, and provides recommendations of learning materials, learning peers and interaction tools that encourage personalized social e-learning. *Q&A Centre*

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useless; 3) neither useless nor useful; 4) useful; and 5) very useful. *Ease of Use*: 1) very hard to use; 2) hard to use; 3) neither hard nor easy to use; 4) easy to use; and 5) very easy to use. 10 out of 21 students responded to the questionnaire. The 36 5-Likert-scale questions formed a reliable scale (Cronbach's alpha = 0.934 for *usefulness*; Cronbach's alpha = 0.948 for *ease of use*) [2]. The results are shown in Fig. 2.
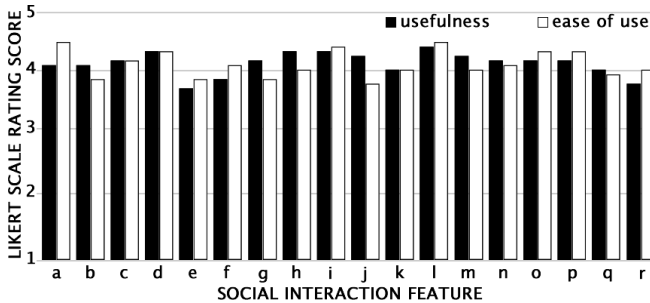

Figure 2.   The *means* of the responses for each social interaction feature

The black columns in Fig. 2 present the results of the perceived *usefulness*. The *means* of the summative results rank between 3.7 and 4.6. The *standard deviations* of the overall results are between 0.516 and 0.994. All the reported values of a *mean* are much larger than 3 (the neutral response), suggesting student attitudes to be generally positive.

The white columns in Fig. 2 present the results of the *ease of use*. The *means* of the summative results rank between 3.8 and 4.7. The *standard deviations* of the overall results are between 0.483 and 1.135. All the *means* are greater than 3, enabling us to infer that most of the students found the social interaction toolset to be *easy to use*.

V.   RESULTS ANALYSIS AND DISCUSSION

On the whole, the questionnaire results demonstrate that the social interaction toolset is perceived to be *useful* and *easy to use*. 83% of all the features have been rated as *useful*, and 78% of the features as *easy to use* (i.e., average mean ≥ 4). A detailed discussion of the individual social interaction tools is presented in the following.

A.   Status

The results indicate *commenting on a status* was rated as the 3rd most useful feature (mean = 4.5), and its *ease of use* was ranked as the 4th highest (mean = 4.5) among all the identified social interaction features. A similar result was found from the qualitative feedbacks. For instance, a student mentioned that commenting on each other's statuses was one of his favorite features to interact with others. While *favoring a status* had the lowest rating (mean = 3.7) on *usefulness* and the 2nd lowest rating (mean = 3.9) on *ease of use*. We can conjecture that 1) the students might not have known what the use of favoring a status was, so it might be necessary to develop a way of providing basic information on less familiar features such as favoring; 2) labels for favoring and un-favoring statuses became invisible when the status was being hovered out, suggesting to keep the labels and the number of times the statuses were favored always visible.

B.   Message

From the results, we can see that *sending a message* was ranked the 2nd lowest (mean = 3.9) score on its *ease of use*. This low rating might be because of the current notification mechanism of receiving a new message. Students can only see the new message(s) notification when they were on the "messaging page". However, when the students were on other webpages, they might not know when and how to use the messaging tools. Therefore, the next version of Topolor will provide a notification widget on the position-fixed top menu bar, which is shown in every webpage in Topolor.

C.   Q&A

The results illustrate that *answering a question* was rated as the most useful feature (mean = 4.6) as well as the easiest feature to use (mean = 4.7), which is further supported by the qualitative feedbacks, e.g., the way of asking and answering questions was explicitly mentioned as favorable. *Asking a question* was rated very high on the *usefulness* (mean = 4.5) and also *ease of use* (mean = 4.5). However, the *usefulness* of *editing the tags of a question* was rated as the 2nd lowest (mean=3.8), and the *usefulness* of *adding tags to a question* was rated as the 4th lowest (mean=4.1). We assume that when a student asked a question in a given learning content area, the relation between the question and the learning content would have been automatically established, so that tagging the question would not have brought additional benefits. Posting questions beyond the learning content area would be necessary to further comment on this feature.

VI.   CONCLUSION

Topolor was designed to provide a wider range of social interaction features than other adaptive e-learning systems. It has been evaluated from different perspectives [3]. This paper focuses on the evaluation of social interaction features with the help of 21 MSc students. A questionnaire with 36 5-Likert-scale questions was used for evaluating each social interaction feature's *usefulness* and *ease of use*. The results of the experimental case study reveal positive attitudes to all the evaluated social interaction features, but we still intend to further improve the system based on the above analyses and discussions. The design of the next version of Topolor has been initiated. Future experiments will focus on the evaluation of the new and improved features.

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