Requirements of Chinese teachers for online student tracking and a comparison to their Western counterparts

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Abstract. Effective teaching requires teachers to know their students and to adapt their teaching accordingly, regardless of taking place in China or in Western countries. This raises requirements on online learning environments: they need to track online learners' actions and present these to the teachers. This paper investigates whether the requirements differ between Western and Chinese teachers. We address this question via the analysis of a questionnaire that investigates requirements collected from Chinese teacher who have been in online teaching field for several years. In this paper, we present a detailed analysis of the requirements and compare the results to the formal survey research on the requirements of student tracking system conducted by Western researchers. We found that several requirements differ significantly. The results of this work are significant as they inform the design of online learning environments in general and online learning data analysis in particular.

Key Words: Student tracking, intelligent tutoring system, online learning, requirement comparison, questionnaire, quantitative analysis

1. Motivation

Student tracking or monitoring can be defined as “activities pursued by teachers to keep track of student learning for purposes of making instructional decisions and providing feedback to students on their progress” [1]. Research on student tracking in Web-based Learning Management Systems (LMS) started at the time these systems were first developed. Peter T. Ewell, Ronald Parker, and Dennis P. Jones discuss basic principle and techniques for constructing a student tracking system [2]. Information on student achievement, effectiveness of educational programs, student retention and persistence is addressed. Goldberg discusses tracking information in the LMS WebCT [3]. Wang predict student performances early by tracking the data on student online activity in a web-based learning management system (LMS) [4] [5]. More recently, John Campbell proposed that the academic analytics of LMS data can identify students at risk of attrition or course failure [6]. Other research shows that teachers could conduct teaching strategies from the analysis of LMS data [7] [8] [9].

In this paper, we investigate whether Chinese and Western teachers have different requirements for student tracking. This paper contributes to learning about cross-cultural difference by investigating the different requirements of Chinese and Western teachers. The work will provide guidance for designing effective educational technology that respects cultural differences. To our knowledge, the work in this paper is the first that investigates this particular question.

The paper is structured as follows. Section 2 discusses related work on student tracking. Section 3 describes the teacher’s questionnaire, summarizes the results from the Western teachers and presents the new results gained with Chinese teachers. From this raw data, Section 4 distills the requirements of Chinese online teachers. Section 5 analyzes and compares the requirements of Western and Eastern teachers. Section 6 gives the conclusions.

2. Related Work on Student Tracking

Research on student tracking in Web-based Learning Management Systems (LMS) started at the time these systems were first developed. Goldberg discusses tracking information in the LMS WebCT [3], for instance the progress of each student through the course material and how often each component is used.

Recent work focuses on providing the teacher further information. ADVisor generates advice on the level of individual students, groups and the whole class [11]. The Classroom Sentinel detects critical teaching and learning patterns, informs the teacher and takes appropriate proactive actions to alleviate detected problems [10]. An "early warning system" for educators predicts at-risk students based on LMS data and allows for more timely pedagogical interventions [12]. The course tracking variables selected from LMS includes detailed logs, number of online sessions, total time online, mail message send and read, total discussion messages posted, etc.

Survey-based research on the requirements of student tracking systems was published, such as [13], [14], [15] and [16]. Mazza and Dimitrova ([13] [20]) found out that information of cognitive and behavioral aspects is of high interest to instructors. On the other hand, social aspects like email and chat have been rated as less relevant for teaching purposes. Zinn and Scheuer's survey ([14]) indicates a high interest in tracking data about student performance, such as success rate in exercises, mastery level for a concept, skill or method, and frequent errors. While teachers expressed less interest in social networks, navigation pattern, and historical usage data. The 15 participants in the survey of [15] were mainly from Canada and Great Britain. Their findings are in accordance with the former empirical studies. Maite Martin carried out an informal survey to detect teacher needs about student mastery and performance [16]. Their results show that student behaviors during learning activities, the characteristics of individual students, and the characteristics of groups of students are the detailed information that teachers want to understand.

However, all previous studies disregard cultural differences and focus on Western teachers. The participants in the survey of [13] were mainly from Swiss, Canada, and UK. The 49 teachers in the study of [14] represent 10 Western countries (USA: 63%, United Kingdom: 12%, Germany: 8%, and others).

3. Teacher's questionnaire and feedback

3.1 Description of the teachers' questionnaire

Our work uses the questionnaire by Zinn and Scheuer as basis. This allows us to compare the requirements collected from the two clusters and to detect significant differences. Nevertheless, in order to cope with the cultural differences in learning

and teaching, parts of it needed to be adapted. Three questions had to be replaced due to differences in LMS functionalities and online behavior:

Firstly, the question “List of most frequently looked-up terms (when a dictionary is available)” is too specific for Chinese learning environment. Often, many learning management systems in China do not have a dictionary, but a question & answer center. We therefore changed this question to “List of most frequently asked questions”

Secondly, in the question “Number of sessions”, session is not widely used in Chinese learning systems, we changed this to “Current learning schedule (such as how many lectures have been learned)”.

Thirdly, the question “Ratio of social activities to all activities” is about communicational tools. Social activities in the Web in China differ from those in the West. In China, the main Web social communication tools are forums. In forums, students discuss the content of online course and other issues not related to learning courses. So we replaced this item by “Percentage of topics in the course forum that discuss learning material”

As a result, all the 35 items used in this questionnaire got fairly good approved rate. This also corresponds to the text feedback from the some response.

3.2 Statistical results

The teachers could rate their answer on a 5 point scale, with the values “very interesting” (weight 5), “interesting” (4), “not very interesting” (2), and “not at all interesting” (1). The calculation method is the same as that used in [14]. The score value for a given proposal resulted from the addition of all votes with their corresponding weights, and a subsequent linear transformation that yielded a scale from 0 to 100. Table 1 shows the 10 highest ranking proposals with the highest scores. Table 2 shows the bottom ten proposals with the lowest scores.

4. Requirement deduced from the questionnaire data

According to Chinese teachers’ feedback to this questionnaire, we infer the following requirement for online student tracking:

1) The online learners’ problems and mistakes

“The list of most frequently asked questions in Q&A center” (rank 1) and “the list of n most frequent diagnosed mistakes and misconceptions” (rank 2) are the

most popular proposals according to the survey. This clearly shows that Chinese online teachers want to be informed about their learners' difficulties and mistakes in the online learning process. This information is particularly interesting for teachers while teaching students in online courses since it allows a timely recognition of and response to current learning problems.

2) Basic information about the learning state

Table 1: Top ten highest ranking proposals

Question No.	Proposal	Score
q7_3*	List of most frequently asked questions	91.5
q5_7	List of n most frequent diagnosed mistakes and misconceptions	91.5
q1_2	Number of learner actions with the system （per week）	87.5
q2_2	Percentage of available exercises tackled	86.9
q4_2	Activity type distributions	83.3
q1_1	Amount of time the learner spends in this course with the system (per week)	82.9
q10_1	Percentage of students communicating on forum(student's percentage）	82.8
q9_2	Allow automatic group clustering by systems	82.7
q8_1	Learner classification（to know different types of students）	82.4
q7_4	List of most frequently trained concepts/skills/methods/competencies	81.5

Table 2: Bottom ten proposals with the lowest scores

Question No.	Proposal	Score
q1_3*	Current learning schedule(e.g. how many lectures have been learned)	70.7
q4_1	Amount of time per activity type	70.2
q3_3	History of past learning contents（e.g. the time spent on different contents last week）	68.6
q3_2	Number of learner activities per section	65.9
q10_2*	Percentage of topics underlying on learning content on forum	64.4
q5_4	Ratio of correct to incorrect steps	63
q5_6	Replay of exercises (in discrete steps)	61.3
q3_1	Amount of time spent per section	56.2
q5_3	Number of steps done	56.2
q9_1	Allow manual definition of group by teacher	54.6

In the free feedback sections of the survey, several teachers commented that "the learner's basic learning state, coverage of learning material, types of learning activities are particularly important" (translated from Chinese). Accordingly, the survey data shows a high interest in basic and overview information. For instance, the items "Percentage of available exercises tackled" and "Amount of time spent in the learning system per week" ranked 4 and 6.

3) Basic learning activities

Similar to the information about the basic learning state, Chinese teachers consider information about basic learning activities as an important feature of student tracking. The corresponding items "Activity type distributions" (rank 5) and "Number of learner actions with the system (per week)" (rank 3) were highly ranked. Overall, the top ten proposals reflect that Chinese teachers pay detailed attention to basic learning activities, such as "exercise tackled," "asking questions in Q&A center," and "communications on course forum".

4) Group learning

Two of three items about group learning asked in the questionnaire rank among the top ten. The item "Allow manual definition of groups by teachers" got the lowest score of all items. We assume that this is due to the fact of the large number of students (remember: a large majority of participants teaches classes with more than 100 students). All in all, group learning is not widely adopted in online learning in China: the survey result shows that only 20% of the participants have used group work in their online teaching. Despite that, the two high-ranking items show that Chinese teacher have an interest in group learning.

5) Fine-grained tracking information is regarded as unimportant

Compared to the high interest in basic learning state, fine-grained tracking information is regarded as being unimportant. The items "Amount of time spent per activity type," "Number of learner activities per section," "replay of exercises (in discrete steps)," "Number of steps done (exercises)," and "Amount of time spent per section" are all ranked in the bottom ten proposals. This is a clear indication that currently it is not highly relevant to record and analyze learners' learning activities in too much detail. Again, the large number of students that Chinese teachers have to support makes a detailed activity analysis impracticable and calls for a more focused or condensed presentation of tracking data.

5. Comparison and Discussion

In order to find out whether there are any differences between the needs of Chinese and Western teachers, we compared our results to previous research. Since the findings of several recent empirical studies ([14] [15] [16]), are, by and large, in accordance with one other [14], we focus on a quantitative comparison between our Chinese sample and the Zinn and Scheuer ([14]) sample.

5.1 Comparison the profiles of two different groups

Similarities: Some of the profiles of participants from China and Western are similar. Such as, most of the respondents are teachers/instructors/tutors/facilitators, some of them are course coordinators. More than 50% of respondents are involved in 2 to 5 online courses. The facilities that have been used in online courses are all included content material, discussion forum, e-mail, chat, and dictionary. They all have experience in different learning systems including WebCT, Blackboard, Moodle and others developed by different institutions.

Differences:

1) There are more higher education students participating in online courses in Western countries. While in China, Half of teachers worked with junior college students. And only 5% of all the participants have the work experience with postgraduate students.

2) The online class in China is larger a lot than Western's. 85% of the Chinese teachers taught classes with more than 100 students. While the largest classes of 50% of the Western teachers had 20 to 50 students.

3) More pure distance learning via web-based environment conducts in Western. 65% Western teachers involve in pure distance teaching. As for teaching model, traditional face to face teaching, online teaching, video lecture provided in website, broadcast via satellite and, lectures in CD, and online tutoring are all adopted by NECs. Blending learning is a popular teaching model in China.

5.2 Comparison the requirements of two different groups

Similarities: There were no significant differences regarding student's achievement tracking information. Teacher want to have information about their students' problems and mistakes, their mastery of individual concepts/skills/methods/ competencies, and their performance in learning system.

The findings are in accordance with other western studies, like [15] [16].

Differences: Figure 1 provides the proposals that got different approval rates from Chinese and Western teachers. The main three differences are the following.

Some fine-grained information is of high interest to the Western teachers but not to Chinese teachers, such as “number of learner activities per concept/skill/ method/competency,” “amount of time spent per concept/skill/ method/ competency,” and “number of learner activities per section”. This is mainly because the different classes scale in Western and China. The online class in China is larger a lot than Western’s. Even some of the Chinese online classes have several hundred students.

Chinese teachers want to teach online student in group. They like to classify students according to different types, such as interest, knowledge status, or preferences. Large scale online classes make it necessary for teachers to apply a variety of teaching strategies to adapt to the different needs and backgrounds of learners [17]. Group teaching is essential for effective online tutoring, but it is hard for them to group such a large number of students without system help. So automatic group clustering by some intelligent technologies is a welcomed method.

6. Conclusion

This paper investigates differences on online student tracking. Being able to track student’s misconceptions and mistakes is of high interest to all teachers, in both, China and Western countries. For Chinese teachers, the basic learning activities and learning state are highly valued information about students. Information on the coverage of learning material, percentage of available exercises tackled, is helpful to teachers to know whether students study or not and how much effort they put into learning. The information of the types of activities, the amount of time spent in the learning system per week, can teachers inform about the interest of the students in their course. Because Chinese classes often have a very high amount of students, teachers prefer to teach in groups and thus automatic group clustering preferred over a manual definition of groups. Compared to the Western teachers, Chinese teacher value less of fine-grained tracking information.

The information in this paper contributes to the design of cross-cultural technology-enhanced learning systems and meaningful online learning data analysis.

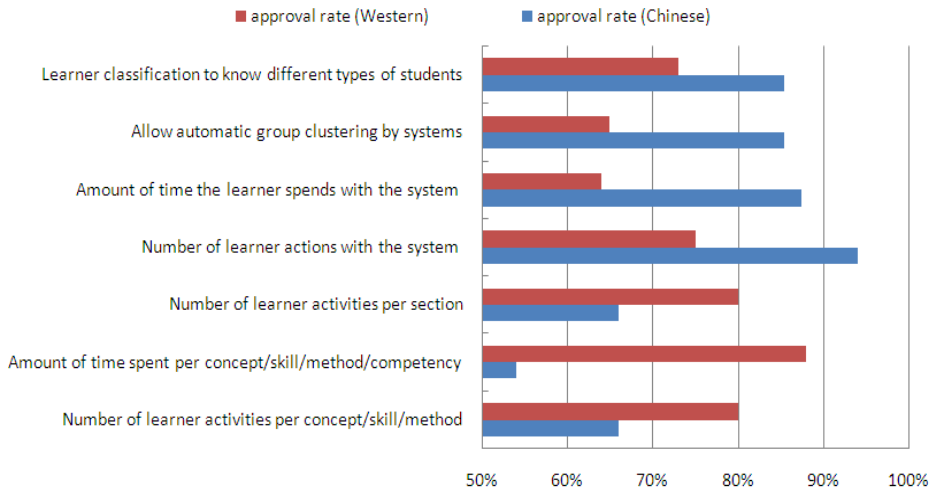

Figure 1: Proposals with different approval rate from Chinese and Western teachers

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