

Annotation Recommendation for Online Reading Activities

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Abstract. Both classroom and online learning ask students doing reading activities. The mature and widely used e-readers allow students reading and making annotation on the screen with their computer, tablet, or even smartphone. Annotations will be a very important resource aside from the notes for students while preparing for exams. However, sometimes students might think something is not important or relevant or just simply overlook while making annotations on the materials. Such annotations might lead to lose marks later when they are writing exams. The research team has developed an online annotation system that allows teachers to create online reading activities for their students and review students' annotations on the e-text. Moreover, with the help of a bio-inspired innovative clustering method GRACE (General Rapid Annotation Clustering Enhancement), students will be offered annotation recommendations based on the similarity their annotations have from other students on the same text. In such case, students may reconsider the content they chose to ignore or overlooked earlier and make their annotations more complete and better for exam preparation later..

Keywords: annotation, bio-inspired approach, clustering, e-text, recommendation

1 Introduction

Nowadays students are getting used to read on digital devices include computers and tablets. Liu did a research on getting people's reading habits change in the last 10 years [4]. Eighty-three percent of participants said that they increased read electronically. Similarly when students were offered to receive hard copies or read online with digital ones, Chrzastowski and Wiley found that students prefer the digital ones more [2]. Bounie and colleagues [1] also found that Amazon sells more digital books than printed books, especially in higher education [3].

In most of courses teachers usually ask students to read pieces of articles on papers or in a text as reading assignments. When students do reading activities, they make

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annotations on the reading materials. The annotations include notes taking and words or sentences highlighting [5]. They have their preferred ways to make annotations while reading; for instances, some of them may annotate the important words they thought in different ways (e.g., highlighting, underlining, or double-underlining).

Taking a piece of a text in the "Pollution" article[1] – "Every year in the U.S. factories release over 3 million tons of toxic chemicals into the land, air and water" – as example. When three students, John, Andrew, and Mary, see this text, John might only circle the word "air" since he feels that is the most important thing he should remember; Andrew, on the other hand, might underlines the whole sentence as he feels this information is extremely important; and, Mary, she chooses only to highlight the three words – "land", "air", and "water" – due to she believes that an item in exam may ask the destinations those toxic chemicals are released into.

First of all, they might all right about the importance of particular text or word(s), but they choose to use different way to annotate. Second, they have different perceptions toward the importance of the text and/or word(s). For example, although John and Mary have similar annotations, John either intentionally ignores or just overlooks the other words "land" and "water" while making annotations. When John is preparing an exam with the annotated article he made, he may skip those un-annotated words because he thought that he had filtered and annotated all important words or concepts already. In such case he probably will only mention "air" when he sees a question of "Environment Pollution" in the mid-term exam asking where the toxic chemicals are released to and he may lose some marks for that.

To avoid missing important thing while preparing for quizzes and exams, students usually consider to take a look at classmates' notes and even annotated texts. With such method, taking abovementioned John's case as example, he might notice that the words "land" and "water" were highlighted in Mary's text but were missed in his text. Under such circumstance, he might also consider to further circling the two words on his copy and this action may lead him to answering the question in the exam later better and getting higher marks for the exam.

The research team has designed and developed an online annotation system which acts as a platform to allow teachers creating reading activities and students doing online reading and making annotations with a variety of ways – highlight, underline, bold, italic, and the use of sidebar notes and different colours. The system also has a built-in GRACE (General Rapid Annotation Clustering Enhancement) clustering method running behind the scene to automatically group students according to their annotations [4].

With GRACE's help, the system can prompt annotation recommendations for a student immediately according to the clustering results when he or she make an annotation on the reading material. The annotation recommendations are made based on the difference among the annotations made by the students who are clustered into same group. This way, since the students in the same group are treated to have similar annotation behaviours which also implies they might have similar perceptions toward the importance of words and the passages, reminding students with the annotations

[1] http://webpage.pace.edu/jb44525n/page5.html

that others in the same group made may help them review and notice the potential information they overlooked or considered less important.

The paper is organized in the following way. Sections 2 and 3 use cases and screenshots to explain how teachers and students can use the online annotation system for their reading activities in their course. Section 4 makes conclusion and talks about next steps.

2 How Teachers Use the Online Annotation System

The online annotation system and its features can be seen online2. Both of teachers and students now are allowed to self-register an account and use the system. As soon as teachers register an account and sign in the system, they can create and manage their own courses freely as Fig. 1 shows. When they create a course, they need to enter a variety of information about the course – course year, season/semester/term, number, and name. They may also click "Choose" link to enter particular course to manage reading activities and review their students' annotations. They may always switch to another course by clicking "Choose a course" link at left hand side menu shown in Fig. 2.

A course can have many reading activities and teachers may setup starting and ending dates for a reading activity. Taking Fig. 2 as example, teachers can initiate the reading activity creation process by clicking "Creating reading activities" at left hand side menu. They then need to enter the reading activity's name, start and end dates, as well as the text for reading. At bottom of the reading activity creation page, a check box "No suggestion" allows teachers to decide whether or not the activity is going to provide students annotation recommendations while reading. If they think it is a good idea for their students to simply read alone, then they can choose to check this box.

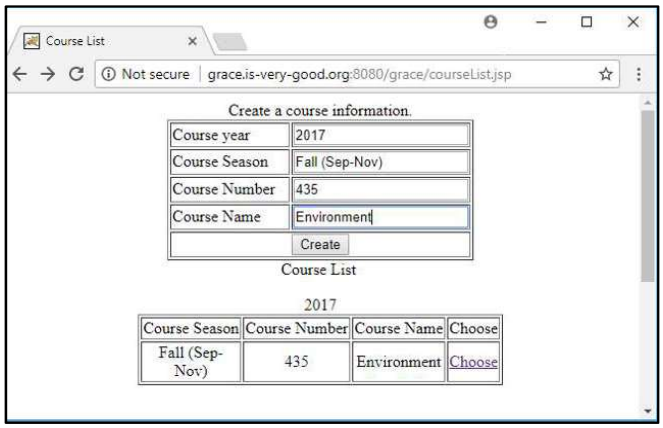


Fig. 1 Course creation and management.

[2] http://grace.is-very-good.org

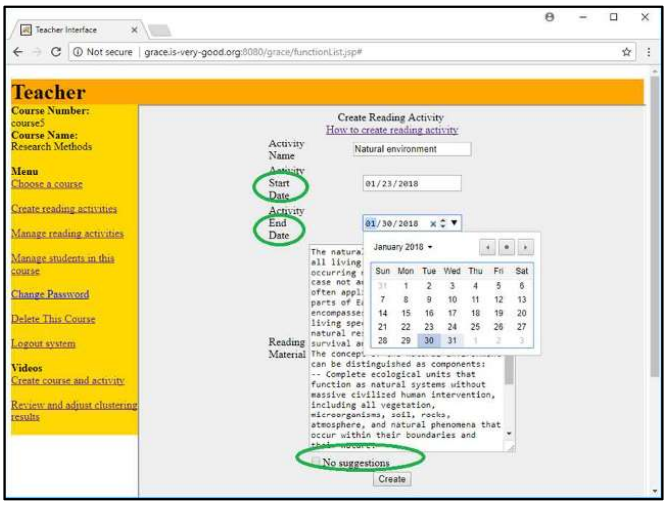


Fig. 2 Reading activity creation.

Teachers can then see and manage all reading activities they created for a course by clicking "Manage reading activities" link at the menu as Fig. 3 shows. From the list of reading activities, they can not only update and delete a reading activity but also review the annotations their students have made so far. Teachers may see the computerized clustering results or manually group students according to their wish.

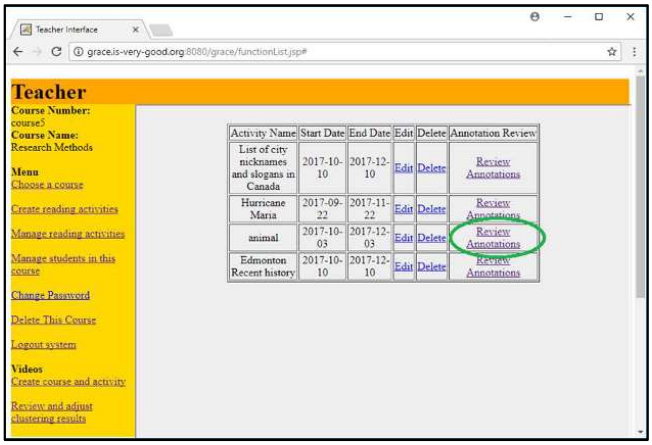
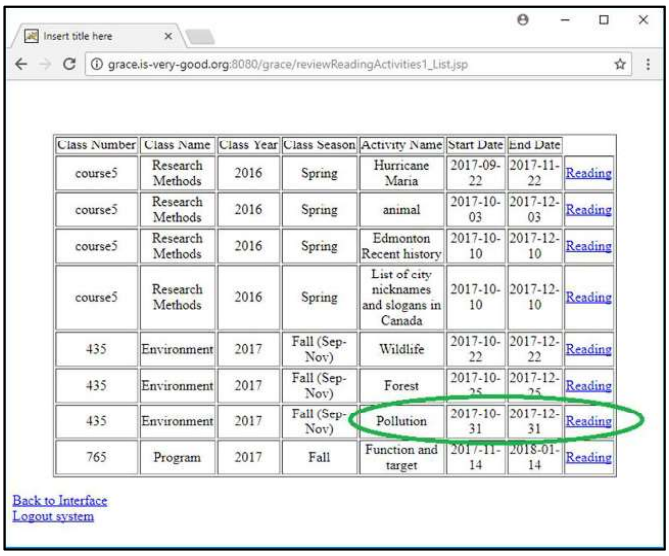


Fig. 3 Manage reading activities.

3 How Students Make Annotations and See Recommendations

When students register an account and sign in the system, they can see all courses in the system and enroll the courses they like. As soon as they enroll a course, they can check out what reading activities teachers created as Fig. 4 shows. They can start to do a reading activity by clicking "Reading" link when the activity is available – the day is between the start and end dates.



Class Number	Class Name	Class Year	Class Season	Activity Name	Start Date	End Date	
course5	Research Methods	2016	Spring	Hurricane Maria	2017-09-22	2017-11-22	Reading
course5	Research Methods	2016	Spring	animal	2017-10-03	2017-12-03	Reading
course5	Research Methods	2016	Spring	Edmonton Recent history	2017-10-10	2017-12-10	Reading
course5	Research Methods	2016	Spring	List of city nicknames and slogans in Canada	2017-10-10	2017-12-10	Reading
435	Environment	2017	Fall (Sep-Nov)	Wildlife	2017-10-22	2017-12-22	Reading
435	Environment	2017	Fall (Sep-Nov)	Forest	2017-10-25	2017-12-25	Reading
435	Environment	2017	Fall (Sep-Nov)	Pollution	2017-10-31	2017-12-31	Reading
765	Program	2017	Fall	Function and target	2017-11-14	2018-01-14	Reading

Fig. 4 List of reading activities

Fig. 5 shows the user interface that students are reading and making annotations. They can choose single or multiple ways for making annotations, for instance, if they want to use green colour and bold font to annotate a passage, then they need to select "Multiple choice" option instead of "Single choose". When they annotate the word "wheelbarrow" on the text, the system automatically remind them to take a look back to see if they overlook "chemicals and wastes into" and may want to annotate it. If they think the recommendation is not useful, they can choose to click "Close" button to dismiss the recommendation. Students can also feel free to check "Hiding suggestions" to tell the system not giving them recommendation and avoid interruptions while reading.

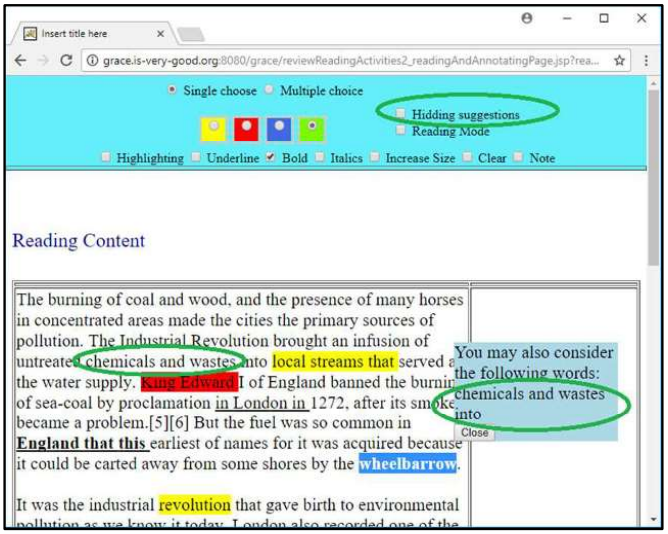


Fig. 5 Making annotations and receiving recommendation

4 Conclusion

The research team has designed and developed an online annotation system which allows teachers to create reading activities for their students and provides students annotation recommendations according their annotation similarity compared with their classmates. This paper explains how teachers and students can use the system. The next steps for the research team include (1) conducting pilots and experiments to know whether or not the system can really help teachers to know their students learning problems and how students perceived the usability toward the system; (2) providing alternative annotation recommendation mechanism which gives students recommendations about annotations made from students who are not in the same group – heterogeneous recommendation. The rationale of having heterogeneous recommendation is because sometimes "thinking out of the box" may help students learn better.

Reference

[1] Bounie, D., Eang, B., Sirbu, M., Waelbroeck, P.: Superstars and outsiders in online markets: An empirical analysis of electronic books. Electronic Commerce Research and Applications, 12(1), 52-59 (2013).
[2] Chrzastowski, T. E., Wiley, L. N.: E-book Use and Value in the Humanities: Scholars' Practices and Expectations. Library Resources & Technical Services, 59(4), 172-186 (2015).
[3] Lopatovska, I., Slater, A., Bronner, C., El Mimouni, H., Lange, L., Ludas Orlofsky, V.: In transition: academic e-book reading in an institution without e-books. Library Review, 63(4/5), 261-275 (2014).
[4] Liu, Z.: Reading behavior in the digital environment: Changes in reading behavior over the past ten years. Journal of documentation, 61(6), 700-712 (2005).
[5] Tashman, C. S., Edwards, W. K.: Active reading and its discontents: the situations, problems and ideas of readers. In SIGCHI Conference on Human Factors in Computing Systems, pp. 2927-2936. ACM (2011).
[6] Chang, M.-H., Kuo, R., Chang, M., Kinshuk, Kung, H.-Y.: Online Annotation System and Student Clustering Platform. In 8th International Conference on Ubi-Media Computing, pp. 202-207, IEEE (2015).