Advancing the 4C's through social bookmarking and collaborative discussions in an undergraduate physics class

Critical thinking - Collaboration - Communication – Creativity

Duncan Carlsmith and Kyriaki Chatzikyriakidou, University of Wisconsin-Madison

Abstract

In this study, we evaluated the effect of weekly bookmarking activities and collaborative discussions on the student's learning, as expressed by critical thinking, collaboration, and communication skills, as well as creativity (4C's). This is the first report on Diigo used in a physics class and, although results are promising, further research is needed.

Introduction

Cooperative learning experiences can be constructed in classroom if the five elements, positive interdependence, promotive face-to-face interaction, individual accountability, social skills, and group processing, are met as described by Johnson, Johnson and Smith (Jones and Jones, 2008). Social bookmarking technology is gathering interest in education (Farwell and Walters, 2010) especially in the recent years and knowledge-related social network platforms are being built for use in education. The aim of this study was to evaluate the effect of weekly activities, entailing use of the social bookmarking network, Diigo.com, as well as group discussions in a collaborative learning environment on student's learning, as described by the 4C's in an undergraduate physics class

Collaborative learning classroom (CLC)

A CL classroom is specially designed for interactive group work and is equipped with technology devices that students can use to project their work. During the weekly discussions, students were introduced to LaTeX, a software package that is designed for creating and writing formulas in a text document. The instructor let students experience LaTeX for the first time with a short assignment and, after this training, all subsequent homework was completed using LaTex only. Furthermore, students were trained how to use the library database for physics journal article search. Campus Library User Education (CLUE) is a multimedia tutorial for college-level research tools and strategies offered by the UW-Madison Library system. In this class, students were firstly asked to watch CLUE and other online tutorials and then received a 20min. workshop on library research by a physics department librarian. Afterwards, they received further guidelines from the instructor on how to perform a physics news and journal papers search.

Bookmarking activity through Diigo.com

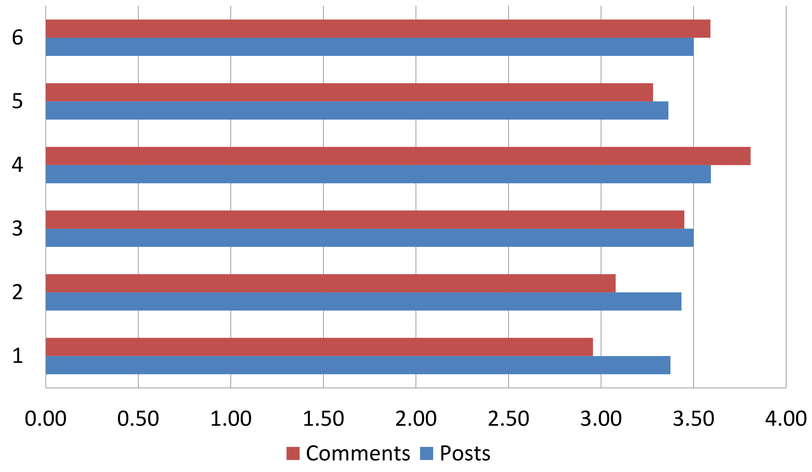
Diigo (diigo.com) is a social bookmarking tool, designed for knowledge management. Students, were asked to sign up to a Physics 241 Diigo group, created by the instructor, and to participate in weekly bookmarking activities. Each week, students posted a physics research paper, related to the topic taught in theory class that same week. The following week, students commented on 5 research papers, previously posted by their peers. This rotation of bookmarking and commenting was continued throughout the semester and students received a grade (10%) for these activities. Rubrics on bookmarking and commenting physics research papers were provided at the beginning of the course.

Evaluation

Pre- and post-surveys

Pre- and post-surveys or questionnaires were composed of multiple choice and scale questions, covering all the areas of interest of this study; critical thinking, collaboration, communication and creativity. The questions were designed based on the guide book "Preparing 21st century students for a global society – An educator's guide to the "Four Cs" published by the National Education Association. Additionally, there were a few questions of self-evaluation on personal interests of students, such as interest in physics or in following a career in physics, and self-motivation in reading physics research papers, before and after taking this class. These questions were important for assessing the net effect of Diigo activity and CLC discussions on student's learning, while taking into consideration the background of the student. Control groups, i.e. students not participating in these activities, were not applicable in this course. Instead, parallel questions, questions that are addressed in both pre- aand post- surveys differing in time, were included in the surveys for comparative analysis.

Average grades of Diigo posts and comments



(vertical axis shows 6 pairs of weeks)

References

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2. Exploring the use of social bookmarking technology in education: an analysis of students' experiences using a course-specific Delicious.com account. T. Farwell & R. Waters. 2010. MERLOT Journal of Online Learning and Teaching, Vol. 6, (2), pp:398-408.
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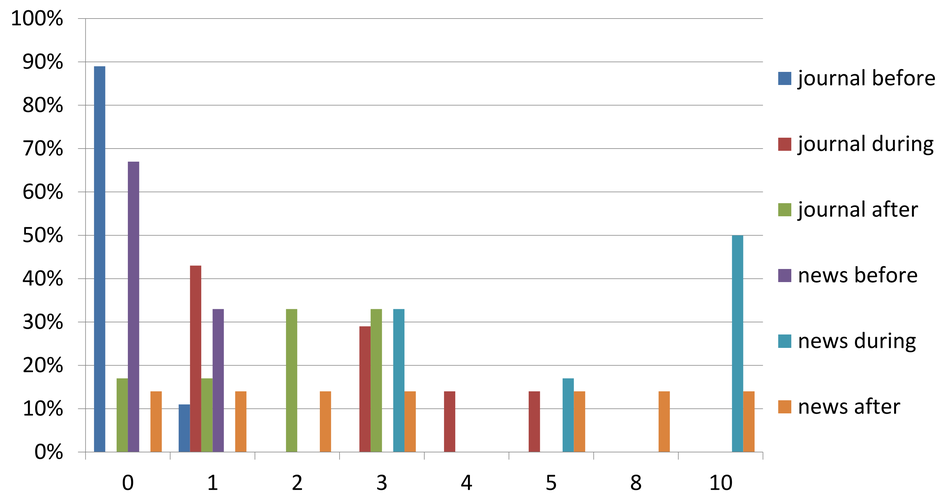
How many physics journal or news articles students read before, during, and expect to read after this class



(Horizontal axis shows the number of physics journal or news articles)

Observations

- Overall, high quality grades for both posts and comments were recorded, although participation was sometimes limited to 50% of the class. None of the students, responding to the survey, stated that they had prior experience in using Diigo, and only 22% had previously been in a collaborative learning classroom (CLC).
- The "parallel" question on number of physics news and journal articles in relation to time (before, during and after) showed that students read many more articles during class, compared to the beginning. Also, the majority indicated that they will keep reading after class, with a preference to physics news articles.
- In the post-survey, students stated that their collaboration and communication skills, as well as their critical thinking and creativity improved due to their participation in the weekly discussions in CLC. For comparative reasons, the same questions were asked about the bookmarking activity. Although improvement of skills was indicated, scores were lower than those given for the weekly discussions.
- Regarding student's critical thinking, both Diigo posting and commenting, as well as group discussions were found to help students improve their skills. In-person interviews were conducted in order to orally examine student's ability. Data are being processed and this information will help authors understand the effect of participation in Diigo on critical evaluation of physics research publications.

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