Effective Use of Open Educational Resources in Computer Science Education: A Query to Inform Open Textbook Development

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ABSTRACT

Open Educational Resources (OER) are changing how we teach and learn computing science. In this study, aiming to inform open textbook development for a computing science course, we explore student preferences in using educational resources. Our initial findings show while students like to purchase and keep textbook for theoretical and foundational courses, there is a strong preference for using OER, especially video resources, either lectures or short topic-based videos, for learning technical course materials.

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Access to educational resources plays an important role in student performance. Steady increase in textbook prices, and limitations of lending and renting digital textbooks are causing students to skip assigned reading [8][1]. The shift towards using low-cost, no-cost, and OER has started in response to this change, and accelerated by the shift to online education during the COVID-19 pandemic [1]. Researches show no meaningful difference in learning efficacy in adoption of open or commercial textbooks [2], suggest improved performance in adoption of e-textbooks compared to courses with no e-textbooks [6], and improved performance in adoption of OER compared to courses with paid textbooks skipped by students [3][9].

Textbooks often provide additional resources, among which high-level reviews, practice questions, and analytical problems are popular among students. Companion materials such as videos, additional exercises, labs, hands-on practices, tutorials, additional articles, links to digital content, and exploratory projects are also making textbooks appealing for students. Though, most of the textbooks with such extensive set of resources are commercial.

Availability of online learning management systems (LMS) and online interactive textbook platforms[4] and their efficiency in interactive capabilities and organizing educational materials makes it possible to explore alternatives for diversified learning through OER beyond textbooks. An effectively organized collection of content through an LMS or an interactive open textbook platform [4] can be used instead of traditional commercial or open textbooks. While factors affecting adoption of OER [1][8] and student performance in adoption of open textbooks [5][7] have been studied, our knowledge on format and student adoption of open textbooks compared to OER collections is limited.

Sense of achievement in finishing a textbook, digital divide in electronic OER access, coherence of materials in textbooks compared to OER collections, and unified format throughout a textbook suggested student preferences for textbooks in initial discussions. This was contrasted to frequent updates, versions, and amended content of online resources, especially those from industry.

Inspired by these observations, we started asking ***what makes a successful computing science educational resource?*** We analyzed grades and student reviews from four offerings of a course, Spring 2020 to Fall 2021, to pinpoint content usage. We designed a survey on use of educational resources. We recruited participants from three different computer science courses and a cohort of MBA students, and conducted follow up interviews. Our initial results show student interest in using open textbooks and OER. The interesting finding is the strong preference in using video-based OER as a replacement for textbook reading. While students like to purchase and retain textbooks for foundational and theoretical courses, they show strong preference in using video for learning technology and hands-on components as a replacement for textbook reading. We also learned about preferences on electronic product features such as search, interactions, tagging, ranking, highlighting, accessibility features, etc., that can help or otherwise affect adoption of an educational resource beyond the content and open availability.

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