Category

- ☐ Data-Driven Course Design
- ☐ MOOC Success Stories
- ☐ Blended/Hybrid Learning
- ☐ Applications of the Science of Learning (in Online and Blended/Hybrid Learning)
- ✓ Innovative Use of Digital Learning Environments (such as interesting uses of MOOCs, etc.)

Title

The 3.024x Comic Book Project

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University or Organization

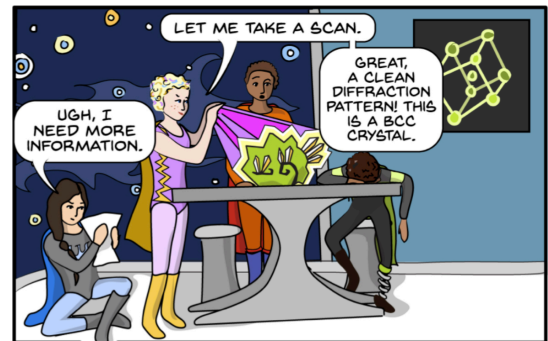Massachusetts Institute of Technology, Cambridge, MA USA

Abstract

In the Spring of 2018, the Department of Materials Science and Engineering at MIT launched 3.024x: *Electronic, Optical, and Magnetic Properties of Materials* as a Massive Open Online Course (MOOC) on the edX platform. This course incorporated comic book-related themes in the problems sets in an attempt to increase student motivation and engagement and decrease student stress. Here, we present learning outcomes and student impressions of these comic book-themed homework assignments.

Introduction

In the Spring of 2018, the Department of Materials Science and Engineering at MIT launched 3.024x: *Electronic, Optical, and Magnetic Properties of Materials* as a Massive Open Online Course (MOOC) on the edX platform. This course is a core feature of the undergraduate MS&E curriculum at our institute, and it introduces the fundamental principles of quantum mechanics, solid state physics, electricity, and magnetism that describe the origin of the electronic, optical, and magnetic properties of materials. The course covers a wide range of topics in the domains of engineering, quantum and solid state physics, and device physics. In parallel to the MOOC offering, 3.024 was offered to undergraduate students at MIT, incorporating many of the educational resources developed for the MOOC.

Figure 1: Example comic from 3.024x. Comics were designed and developed by Emma Vargo and Jane Holland.

Professor Polina Anikeeva, lead instructor for the course, has traditionally used comic book-related themes in her classroom in order to increase student motivation and engagement, and to decrease student stress levels while tackling difficult subject matter. This paper presents the 3.024x course team's work to incorporate these comic book themes into the homework assignments in the 3.024x MOOC.

The comic design project was motivated by the teaching staff's classroom observations as well as a body of research in the use of humor in the classroom has demonstrated promising improvement in the following areas:

- Student attitudes, enjoyment, and opinions of their instruction have been shown to increase when content-related humor is introduced [1,2].

- Secondary school students who were presented with comics demonstrated better scores on a creativity test designed to measure fluency, flexibility, and originality of thought [3].

- Several studies have shown an improvement in final exam and post-test performance when content-related comics or humor were used in the mathematics, engineering technology, and psychology classrooms [2, 4, 5, 6].

During the Spring '18 run of the 3.024x MOOC we conducted an A/B test where the treatment group received a comic-based Homework #1 while the control group received traditionally-formatted homework problems. We looked for difference is course participation and retention between the two groups. Additionally, we evaluated the both the residential students' and the MOOC learners' perceptions of the comic-based assignments.
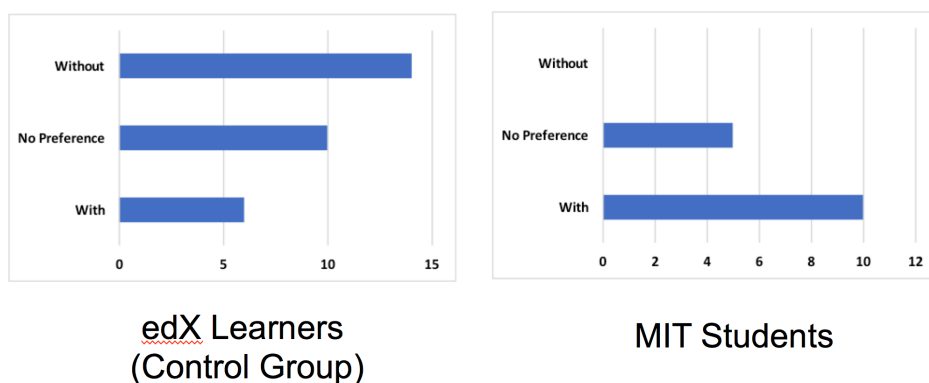
Results

In the 3.024x MOOC, we did not observe any statistically significant difference in either course participation or performance between the comic group and the control group. Table 1 shows the number of learners in each group who attempted Problem Set #1 and the mean score of all learners in the group who made an attempt.

Table 1: Problem Set #1 completion and performance

	Comic Group	Traditional Group
Number of learners who attempted Problem Set #1	148	145
Mean Score	56.2%	55.4%

Figure 2 shows student responses to the question, "Did/Would you prefer assignments with or without comic strips?" We observe that there is a large difference in how the residential MIT students and the edX MOOC learners view these comics.

Table 2: Student survey results. The control group of edX learners were asked, "Did you prefer assignments with or without comic strips?" All residential students were asked, "Would you prefer assignments with or without comic strips?"

edX Learners
(Control Group)

MIT Students

We conclude that in the MOOC environment, the presence of comic-strip themed homework assignments had no influence on student performance or participation. However, we would caution against extrapolating those results to the residential MIT students because they had a much more positive response to the presence of the comics within the problem sets

Course Team

This course represents the efforts of a large number of people. Prof. Polina Anikeeva was the lead project faculty. Emma Vargo lead the comic design and Jane Holland was the graphic designer on the project. The course development team included George Varnavides, Sara Warkander and Jonathan Paras, and Maddie Sutula and Emma Vargo provided learner support while the course ran on edX. The MITx MOOC development team, including David Chotin, Shelly Upton, Lana Scott, Mary Ziegler, provided course development support.

Bibiliography

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