A measure of motivation in an online astronomy course

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Abstract. Student motivation is a perennial problem in tertiary education, and it can be a struggle to maintain student motivation in even the most fascinating courses. Extensive research on motivation broadly provides educators with tools to implement interventions to improve motivation. This study tracks students' motivations for learning across a teaching period in an online tertiary astronomy course. We show that students' intrinsic motivation to learn is higher at the end of the course compared to the beginning, and that students identified factors such as interesting content, freedom of choice, acquisition of knowledge, and format of assessments as influencing their motivation.

Introduction

Motivation is defined as the factors that cause individuals to move towards specific tasks [1]. Extrinsic motivations, such as grades, lead to less positive educational outcomes than intrinsic motivations, such as curiosity [2]. There is extensive literature on student motivation, with several models suggesting that the following factors positively affect a student's motivation: feelings of competency and self-efficacy, opportunities for autonomy [3], and a sense of belonging [4].

In this work, we aim to understand how the motivations of students change over the duration of an astronomy course and identify factors that influence this change. This study fills a gap in current knowledge around students' motivations in introductory astronomy courses and provides valuable insights into simple techniques that may improve students' motivations broadly.

Methods and findings

Twice in the teaching period (beginning and end), a motivation questionnaire (a combination of the Motivated Strategies for Learning Questionnaire (MSLQ) [5] and the Motivation to Learn Online Questionnaire (MLOQ) [6]) was administered in a wholly online introductory astronomy course. An additional open-ended question about factors affecting motivation was included in the end survey. The survey quantifies the following seven factors for each student on a Likert scale: intrinsic motivation, extrinsic motivation, task value, expectancy, self-efficacy, social engagement, and instructor support. Mean Likert scale data for each factor were calculated for each student for the beginning and end survey data. An unpaired t-test determined statistical significance. The means are also used to quantify the proportion of students moving between levels of agreement for each factor during the course. A thematic analysis was performed on the open-ended question.

Data collection is ongoing; these are preliminary results for one cohort of students ($N = 170$ for the beginning of the teaching period survey and $N = 141$ for the end of the teaching period survey). Intrinsic motivation was significantly higher after completion of the course compared to the start ($p < 0.05$), as shown in Fig. 1. No other factor saw a significant change. The proportion of students that had "high" intrinsic motivation (agreed with the intrinsic motivation questions) shifted from 48.4% to 62.8% during the course, as shown in Fig. 2. The proportion that had "low" intrinsic motivation (disagreed) was unchanged, and those with "medium" intrinsic motivation (a mixture of agree/disagree) shifted from 47.1% to 32.5%. Our thematic analysis yielded factors such as interesting content, freedom of choice, acquisition of knowledge, and format of assessments as influencing their motivation.

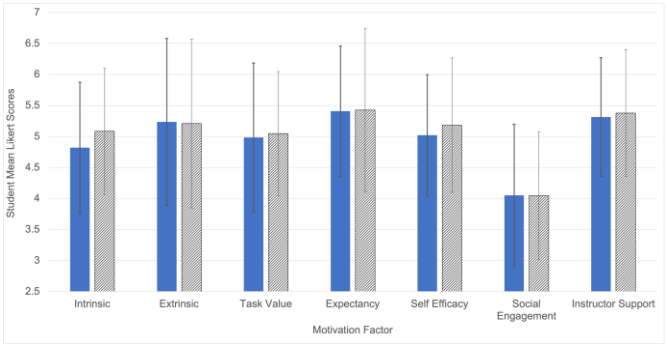

Fig. 1. Mean Likert scale data for each factor affecting motivation. Error bars are standard deviations.

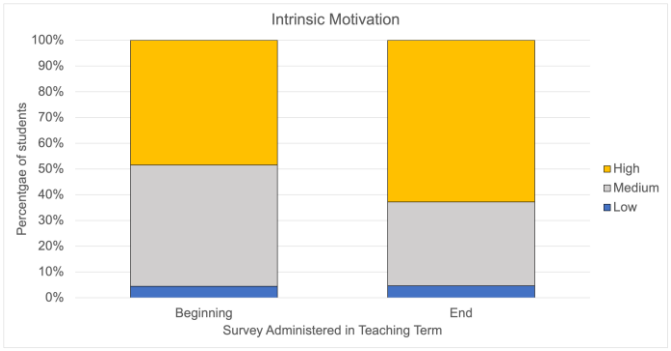

Fig. 2. Proportions of students rated as having “high”, “medium”, and “low” intrinsic motivation.

Conclusion

Combining survey result analysis with a thematic analysis shows that the intrinsic motivation of students in the online astronomy course was higher at the end of the course compared to the beginning, and factors such as interesting content, freedom of choice, acquisition of knowledge, and format of assessments influenced their motivation. This research identifies factors that affect motivation for learning and can guide course developments.

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