

## Relationships Between Students' Course Perceptions, Effort, and Achievement in an Online Course

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### ABSTRACT

The primary purpose of this study was to examine the extent to which students' course perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) and cost beliefs predict their effort and grades in an online course. We surveyed 1,446 students in an online geography course. Students completed closed- and open-ended items and we used structural equation modeling and qualitative coding to analyze the data. Students' course perceptions predicted their course effort, which then predicted their final course grade. The quantitative findings demonstrated that students' situational interest and perceptions of instructor caring were statistically significant predictors of their effort and achievement. The qualitative findings indicated that students' perceptions of the usefulness of the course content and their interest affected their effort, as did the amount of time that they had available for course activities. The findings were moderated by students' perceptions of course ease. Students reported decreased effort when they believed that they could succeed and the course was easy, and when they believed it was going to take a lot of time and the course was difficult. This study highlights the importance of designing courses that (a) interest students in the course activities, (b) foster perceptions of caring between the instructor and students, (c) are at an appropriate level of difficulty, and (d) provide a reasonable workload with considerations for students with time constraints. Researchers may use the findings to develop interventions and strategies that instructors can use to encourage students to put forth more effort in online courses.

### 1. Introduction

College faculty have been teaching more courses online over the past decade [1,2], and this trend accelerated in 2020 when many instructors were forced to teach online due to the coronavirus pandemic. Yet, many faculty have little experience in designing online courses that effectively motivate students to put forth effort in meaningful activities. Researchers have found that students' course perceptions are important for instructors to consider when designing instruction because students' perceptions are related to their motivation, effort, and achievement in the course [3,4]. The MUSIC Model of Motivation [5–7] specifies five key perceptions that are critical to students' engagement in courses: eMpowerment, Usefulness, Success, Interest, and Caring (the initial sounds of these perceptions form the acronym MUSIC). Students are motivated and engaged in their learning when they: believe that they have choices and some freedom within their learning environment (feel

*empowered*), believe that the coursework is *useful* for their goals in life, believe that they can *succeed* if they put forth effort, are *interested* in the learning activities, and believe that the teacher and others in the learning environment *care* about them and their success.

These five MUSIC perceptions have been shown to be related to students' effort in face-to-face and online college courses [8,9]. As examples in online courses, students who feel *empowered*/autonomous are more likely to report putting forth effort in an online college course [10]. When students believe their online course is *useful*, they are also more likely to report higher levels of engagement [11]. Related to *interest*, students who are interested in using the social web tools in online courses have been shown to be more likely to put forth more effort through active learning [12]. And a stronger teacher presence in online courses can help students believe that they can *succeed* and increase their beliefs that the teacher *cares* about their learning, both of which could lead to more effort and persistence in a course [13].

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Despite the evidence that students' MUSIC perceptions are related to their effort in online courses, only one study (by Jones [10]) has examined the relationships between all five MUSIC perceptions and effort within an online course. This Jones [10] study demonstrated that all five MUSIC perceptions were significantly correlated with effort in an online college course about Personal Health. However, more research is needed to replicate this finding in other types of online courses. In addition, the Jones [10] study did not relate students' effort to any other outcomes (e.g., grades). Although students' effort is important, ultimately, the goal of most college courses is to increase students' learning and achievement. Researchers have documented positive relationships between students' engagement (e.g., effort) and achievement in some studies (e.g., [25]), and it would be useful to understand the nature of these relationships in an online course.

The aim of this study was to build on these prior studies by focusing on an online college course to examine (a) the relationships between all five MUSIC perception variables and effort and (b) the relationship between students' effort and achievement. Understanding these relationships could be helpful to instructors who teach online courses and to researchers who study motivation-related perceptions. Identifying the most significant predictors of effort and achievement could help instructors select strategies that could be useful to increasing students' effort and achievement in online courses. For example, if students' perceptions of *usefulness* are a significant contributor to their effort, then instructors can work to implement instructional strategies that help students understand why the course is useful.

## 2. Literature review

A simplified version of the MUSIC Model of Motivation theory [6,7] is depicted in Fig. 1. This figure shows that variables internal and external to students affect their MUSIC perceptions in a course, which then affects their motivation and engagement (e.g., effort) in the course, which subsequently affect their achievement in the course. Researchers have documented relationships between various parts of this model in different types of educational settings. For example, providing students with autonomy (empowerment) has been shown to increase student engagement [14,15], perceived instrumentality (usefulness) and self-efficacy (success) have been found to increase engagement [16], curiosity (situational interest) has been associated with students' engagement in science [17], and several studies have shown that the caring relationship between a teacher and students leads to higher student engagement and achievement [18,19]. Yet, very few studies have examined *all five* MUSIC perceptions in the same study to determine whether some MUSIC perceptions are more important than others in predicting students' effort. For example, Jones [10] reported positive correlations between students' MUSIC perceptions and their effort in

two undergraduate personal health courses in the US, one that was delivered online and another that was delivered face-to-face. Other studies investigating relationships between MUSIC perceptions and effort have not focused on online courses (e.g., [9,20,21]). Furthermore, only one of these studies [21] has investigated relationships between students' MUSIC perceptions, their engagement, and their *achievement*.

Fig. 1 also shows that cost/benefit decisions affect students' motivation and engagement in courses. Even when students are motivated to engage in a course, they have to make cost/benefit decisions about whether to engage in the course or to participate in other activities. For example, when forced with the decision to put forth more effort to study for a course test or to participate in another activity (e.g., play video games, socialize with friends), they must weigh the costs and benefits and decide which alternative to engage in. Researchers have identified four different costs associated with engaging in an undergraduate course: task effort cost (the amount of effort the course requires), outside effort cost (the time and effort a course takes away from other responsibilities, such as another course), loss of valued alternatives cost (the other things the person has to give up to engage in the course), and emotional cost (the negative psychological states associated with engaging in the course, such as worry and stress) [22]. If the cost of an activity is too high, students are likely to engage in other activities or spend less time engaging in the high-cost activity. Therefore, cost is a variable that is theorized to be negatively related to students' engagement: when the perceived cost is higher, students will be less engaged in the course.

Another variable that can affect students' engagement and achievement in courses is the perceived difficulty of the course [23,24]. It is logical that when a course is perceived to be easy, students will increase their perceptions of success in the course and vice versa. However, the relationship between students' perceptions of success and *effort* can vary depending on the difficulty of the course. For example, students who perceive a course to be easy would have high success perceptions; yet, they may not put forth much effort because a lot of effort is not needed. Therefore, while the MUSIC model predicts that higher perceptions of success should lead to higher effort, this relationship may not be true when the course is perceived as easy (because effort is not needed when the course is easy). Although some studies have demonstrated that students' success perceptions moderate the effects of motivation-related variables and achievement [25,26], more research is needed to understand these relationships, especially in online courses.

## 3. Present study and research questions

The present study builds directly on prior studies by examining how students' MUSIC perceptions affect their effort and achievement while they are engaging in an online, undergraduate course, as we explain

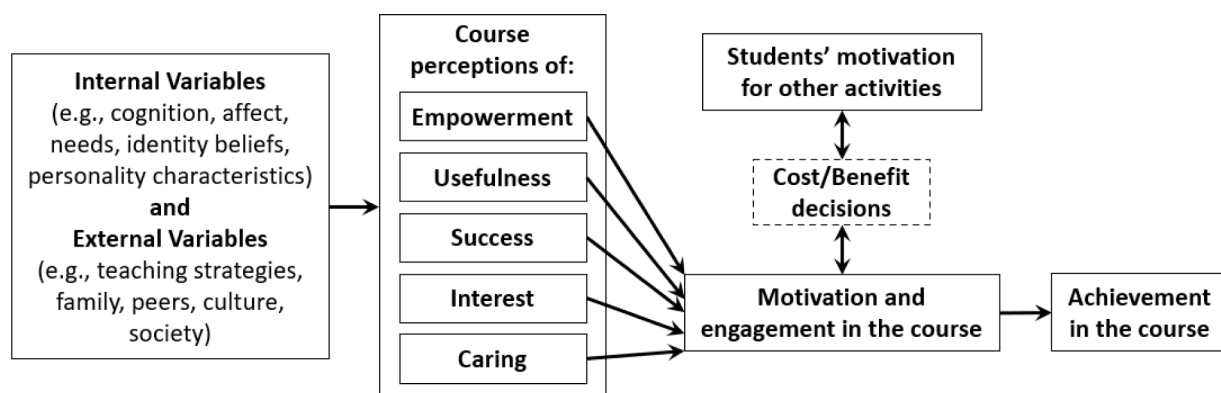


Fig. 1. Theoretical Relationships Between Variables in the MUSIC Model. Note. Theoretical model linking variables internal and external to the student, to students' course perceptions, motivation and engagement, cost/benefit decisions, and achievement in the course. Adapted from "Motivating Students by Design: Practical Strategies for Professors," by B. D. [6]. Copyright 2018 by Brett D. Jones.

here. First, this study included a measure of achievement in the model, which allowed us to examine the relationships between students' MUSIC perceptions, effort, and achievement. Although this analysis is similar to the Jones and Carter [21] study, the context is very different because students in the present study were enrolled in an online course, as opposed to a more traditional, face-to-face course. Second, this study included a "cost" variable to assess students' perceptions of the costs involved in the course. In addition, we collected *qualitative* data to identify the reasons why students did or did not exert a lot of effort in the course. These data can be used along with the quantitative data to provide insight into the cost/benefit decisions students make in choosing to engage in course activities or to participate in other activities (as shown in Fig. 1). Third, this study examined the potential moderating role of the perceived difficulty of the course by including an "ease of course" variable that allowed us to assess whether ease moderated the effects of the other variables in the study.

Our three specific research questions were as follows:

RQ1: To what extent do undergraduate students' MUSIC perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) and cost beliefs in an online course predict their effort and achievement in the course?

RQ2: In what ways does the model in RQ1 vary as a function of students' perceived ease of the course?

RQ3: What do students perceive to be the costs and benefits of putting forth effort in an online course?

Related to Research Question 1, based on prior studies [10,15,27], we anticipated that all five MUSIC perceptions would be positively related to students' effort, and cost would be negatively related to their effort. We also predicted that effort would be positively related to their achievement. For Research Question 2, we predicted that when students perceived the course to be easier, they would put forth less effort because less effort would be needed to obtain a higher grade. For Research Question 3, based on studies of veterinary students who were studied in a similar manner [28], we anticipated that students would provide a variety of costs and benefits associated with putting forth effort in an online course and that these costs would align with those identified by Flake et al. [22] (i.e., task effort, outside effort, loss of valued alternatives, and emotional).

## 4. Method

### 4.1. Participants and procedure

The participants included 1,446 (80%) of the 1,809 students enrolled in an online Geography course at a large public university in the southeastern US (see Table 1 for demographic information). Students completed an online survey near the middle of the course, and they were told that the purpose of the survey was to gather information about the course so that it could be studied and improved. Data were collected near the mid-point of the course (as opposed to the beginning or end of the course) because we wanted to assess students' perceptions while they were in the middle of the course. Students were not offered any incentives for participating and their participation was voluntary. Students were also told that their instructor would not be able to link their responses with their name or email. The researchers collected the online data and provided the instructor with the results to ensure the data remained anonymous to the instructor. This study was approved by the Institutional Review Board (IRB) at the researchers' university.

### 4.2. Description of course

The course was an introductory geography course with 1,809 students enrolled. It was taught online by one instructor, one assistant

**Table 1**  
Observed Frequencies and Valid Percentages of Student Demographic Data

Demographic	Levels	n <sup>a</sup>	%
Sex	Male	886	61.3
	Female	551	38.1
	Other	8	0.6
Race	White or Caucasian	1048	72.5
	Asian or Pacific Islander	189	13.1
	Hispanic	80	5.5
	More than one race	59	4.1
	Black or African American	50	3.5
	Another race not provided	12	0.8
	Native American	7	0.5
Student class standing	Freshman	852	58.9
	Sophomore	276	19.1
	Junior	160	11.1
	Senior	156	10.8
	Master's	1	0.1
Grade in class	A	1020	70.5
	A-	56	3.9
	B+	14	1.0
	B	30	2.1
	B-	13	0.9
	C+	10	0.7
	C	11	0.8
	C-	9	0.6
	D+	5	0.4
	D	5	0.4
	Fail	24	1.7
	Pass	7	0.5
	No grade provided	242	16.7
	Total	1,445	100.0

<sup>a</sup> n = 1,445 instead of 1,446 because one respondent did not respond to the demographic items.

instructor, and two graduate teaching assistants. Students were provided with a variety of assignments that were worth different amounts of points. For example, there were quizzes related to readings, video lectures, and films, as well as three other non-quiz assignments. Each quiz and assignment was worth a certain number of points, and students could complete as many quizzes and assignments as they desired. At the end of the semester, their total number of points was computed, and they received the grade associated with their point total. Students were provided with the point totals needed for each grade range at the beginning of the course (e.g., 900 to 949 points results in a B+).

### 4.3. Measures

All of the student responses were collected near the mid-point of the course using an online survey. The achievement scores were collected directly from the instructor after the course was completed. For all of the closed-ended items, students reported their perceptions using a six-point Likert format scale ranging from 1 to 6 (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Somewhat disagree*, 4 = *Somewhat agree*, 5 = *Agree*, and 6 = *Strongly agree*).

#### 4.3.1. MUSIC model perceptions

To assess students' MUSIC perceptions, we used the College Student version of the MUSIC® Model of Academic Motivation Inventory [29]. The MUSIC Inventory includes 26 items that measure students' course perceptions related to the five MUSIC model constructs: empowerment/autonomy [30], usefulness/utility value [31], success/expectancy [31], situational interest [32], and caring [33]. The empowerment and usefulness scales have five items each, the success scale has four items, and the interest and caring scales have six items each. The following items are examples from each scale (the complete inventory is available at [29]): "I have flexibility in what I am allowed to do in this course" (empowerment/autonomy), "In general, the coursework is useful to me" (usefulness/utility value), "I am confident that I can succeed in the coursework" (success expectations), "The coursework is

interesting to me” (situational interest), and “The instructor cares about how well I do in this course” (caring).

#### 4.3.2. Effort

To assess students’ perceived course effort, we used the four-item Course Effort scale [27]. This scale measures the amount of effort that students believe that they are investing in a course. Here is an example item from the scale: “In this course, I put forth my maximum effort.”

#### 4.3.3. Cost

The Cost scale included three of the four items developed by Kosovich et al. [34] that measure the extent to which students believe that the amount of time needed to do well in the course is not worthwhile. The fourth item was not included because it did not directly assess the amount of “time” the course required, whereas the other three items directly assessed time: “This course requires too much time,” “Because of other things that I do, I don’t have time to put into this course,” and “I’m unable to put in the time needed to do well in this course.” We chose this measure because it provided a means to assess cost more broadly as a measure of outside effort cost and loss of valued alternatives cost.

#### 4.3.4. Ease

To measure students’ perceived ease of the course, we used an Ease of Course scale that measures the extent to which students perceive the course to be easy [35]. The three items in the scale are: “This course is very easy for me,” “I don’t need to work my hardest to get a high grade in this course,” and “In this course, I can get the grade I want with very little effort.”

#### 4.3.5. Achievement

We measured students’ achievement using their final course grades, which ranged from A to F using a plus/minus system (i.e., A, A-, B+, B, B-, C+, C, C-, D+, D, F). Grades were coded numerically as follows: an A was represented as a 95, an A- was a 92, a B+ was an 88, and so on. Some students completed the course on a pass/fail grading system which was represented with a 70 and 55, respectively. Additionally, 242 students did not have grade information which reduced the number of valid cases for the grade analyses to 1,204.

#### 4.3.6. Open-ended effort item

Students were asked the following open-ended questions: “Two questions: How much effort do you put into this course? Why do you put this amount of effort into this course?” (obtained from [28]). We only coded the second question, not the first question, because we measured the quantity of students’ effort with the quantitative effort scale. The first question was provided only to get students to think about the amount of effort they put into the course so that they could more accurately answer the second question.

### 4.4. Analysis

We used Stata IC 16.1 to fit several structural equation models (SEMs) to the data in order to evaluate the direct prediction of students’ final course grades by student effort which, in turn, was directly predicted by students’ MUSIC perceptions and cost. We also examined the indirect effect of the MUSIC perceptions and cost on final grades, and we evaluated this model as moderated by course ease. We fit the models using maximum likelihood (ML) estimation and correlated the MUSIC variables. The model estimation converged appropriately.

Three mutually exclusive groups were developed using latent class analysis to categorize students based on whether students perceived the course to be easy, moderately difficult, or difficult. We evaluated the invariance of the direct paths from the MUSIC perceptions and cost to student effort across course ease latent classes using the Wald test  $\chi^2$  statistic, along with the path from student effort to final grades. Additionally, we estimated the latent trait means of the MUSIC perceptions

and cost separately across course ease latent classes to determine whether students were significantly different. We used several fit statistics to evaluate each model, including AIC (Akaike Information Criterion), BIC (Bayesian Information Criterion), RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), and SRMR (Standardized Root Mean Residual). We evaluated nested models using the likelihood ratio (LR)  $\chi^2$  statistic to determine whether the more complex model fit significantly better. To evaluate the reliability of the scales measuring MUSIC perceptions, effort, cost, and ease, we computed and examined Cronbach’s alpha values for each scale.

We analyzed students’ responses to the open-ended item based on a grounded theory approach [36]. Two authors developed the initial coding scheme by reading 100 randomly-selected responses and creating coding categories. Then, the coders independently coded 200 randomly-selected responses that were not part of the 100 responses used to create the coding categories. They settled coding disagreements by mutual consent and computed the inter-rater reliability rate as a percentage using this formula:  $100 - 100 \times (\text{number of coding disagreements between coders} / \text{number of times that the codes were used})$ . The inter-rater reliability rate was 89.2%.

## 5. Results

### 5.1. Quantitative findings

In Table 2, we summarized the correlations, Cronbach’s Alpha values, observed means, and standard deviations of these variables: the latent MUSIC variables, effort, cost, ease, and grade. Cronbach’s alpha values were good for all the scales ( $> 0.7$ ; see Table 2; [37]), which indicates that the scales were reliable for this sample of students. The mean values for the MUSIC variables were fairly high (about a 5.00 or higher), as was the mean for effort (4.71), whereas the mean values for cost (2.97) and ease (3.86) were closer to the middle of the scale (the middle was 3.50). The skewness was acceptable for all of the variables ( $< 2$ ) except for the course grade, which was likely due to the instructor’s grading scale that led most students to receive an A grade. All the variables exhibited a large amount of kurtosis ( $> 2$ ) but, particularly, final grade. One reason for the high kurtosis value for final grade was due to the way we coded the grades as categorical rather than continuous. For the other variables, a large portion of students responded affirmatively to the inventory items which led to a ceiling effect for which the students received maximum latent trait estimates.

We estimated a model (represented simply in Fig. 2) to evaluate the prediction of students’ final grades by effort which, in turn, was predicted by students’ MUSIC perceptions and cost, as moderated by the ease of the class. The results of the direct, indirect, and total effects of the model are summarized in Table 3.

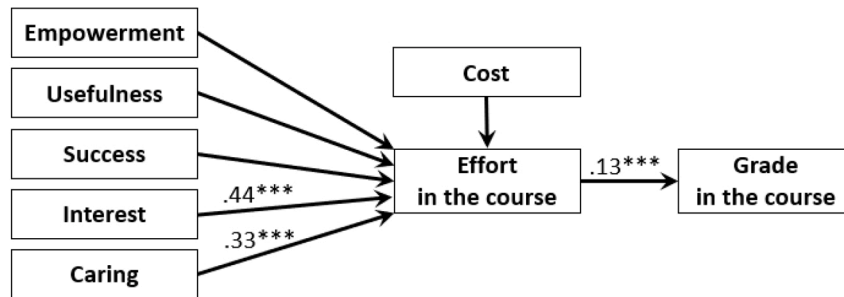
Considering the three fit indices, the overall model fit was acceptable. The RMSEA estimate of .051 met the recommended cutoff value ( $< .06$ ; [38]). The CFI estimate of .930 met the previously-held cutoff convention ( $> .90$ ; [39]), but it did not meet a stricter cutoff ( $> .95$ ; [38]), which has become a more prevalent cutoff value for acceptability in the literature. Nonetheless, the CFI value of .95 is not a strict cutoff value and must be interpreted within the context of the other fit indices [40]. The SRMR estimate of .096 met the recommended value ( $< .10$ ; [41]).

Effort was strongly predicted directly by course cost and the MUSIC model variables, which accounted for 43.3% of the variability in effort ( $R^2 = .433$ ). The strongest direct predictors of effort were interest ( $\beta = .44, p < .001$ ) and caring ( $\beta = .33, p < .001$ ). The remaining predictors, empowerment, usefulness, success, and cost did not significantly predict student effort when all of the variables were included in the model at once. Students’ grades were directly predicted by effort and indirectly predicted by interest and caring. There was a small effect with only 1.8% of the variability in grades accounted for by the predictors ( $R^2 = .018$ ). Effort was the only direct predictor of grades and was the strongest

**Table 2**  
Correlations, Cronbach's Alpha Values, Observed Means, and Standard Deviations for the Variables

	Empowerment	Usefulness	Success	Interest	Caring	Effort	Cost	Ease	Grade
Usefulness	0.45								
Success	0.78	0.49							
Interest	0.63	0.71	0.67						
Caring	0.58	0.47	0.54	0.61					
Effort	0.39	0.47	0.40	0.59	0.55				
Cost	-0.45	-0.23	-0.58	-0.42	-0.24	-0.21			
Ease	0.34	0.07	0.46	0.21	0.09*	-0.07*	-0.21		
$\alpha$	0.85	0.90	0.86	0.90	0.84	0.87	0.86	0.73	
$M$	5.30	4.97	5.38	5.04	5.10	4.71	2.97	3.86	92.71
$SD$	0.68	0.82	0.66	0.79	0.67	0.84	1.12	0.99	7.24
Skewness	-1.21	-0.87	-1.30	-1.03	-0.81	-0.61	0.37	0.02	-3.82
Kurtosis	5.11	4.28	5.60	4.81	4.15	3.53	2.63	2.88	17.70

Note.  $p < .001$  for all correlation coefficients unless noted otherwise.  
\*  $p < .05$ .



**Fig. 2.** Results of the Model Tested. Note. Model tested in the present study with standardized beta coefficients shown for the significant paths. \*\*\* $p < .001$ .

**Table 3**  
Predictive Model Summary and Model Fit Statistics for Baseline Model

Predictor	Predictive model		Overall model fit statistics						
	Effort $\beta$	Grades $\beta$	Effort $R^2$	Grades $R^2$	AIC	BIC	RMSEA (LB, UB)	CFI	SRMR
Empowerment	-0.08	-0.01	Overall = .433	Overall = .018	94700.4	95301.4	.051 (.048, .053)	0.930	0.096
Usefulness	0.07	0.01							
Success	-0.05	-0.01							
Interest	.44***	.06***							
Caring	.33***	.04***							
Cost	0.02	< 0.01							
Effort	-	.13***							

\*\*\*  $p < .001$

predictor ( $\beta = .13, p < .001$ ). Meanwhile, interest ( $\beta = .059, p < .001$ ) and caring ( $\beta = .04, p < .001$ ) were the only MUSIC model components that had positive, significant, indirect predictions of grades.

To examine the effects of course ease on the model, we developed mutually exclusive groups based on course ease and performed a latent class analysis (LCA). Several latent classes were fit to the data (see Table 4), with a three-class solution hypothesized to be the best-fitting model. Despite the four-class solution having somewhat better fit statistics, we selected a three-class solution for both theoretical purposes and model fit. Based on the three-factor solution, students were classified into one of three groups based whether they thought the class was

**Table 4**  
Model Fit Statistics for Latent Class Analysis of Course Ease

Latent Classes	Log-Likelihood	df	AIC	BIC
1	-6999.6	6	14010.0	14041.7
2	-6646.7	10	13313.4	13366.2
3	-6535.2	14	13098.5	13172.3
4	-6495.3	18	13026.6	13121.6

Note.  $n = 1,446$

difficult, moderately difficult, or easy (with probabilities of .14, .61, and .25, respectively; see Table 5). Based on the standard error estimates, there was acceptable precision in the latent class probability estimates. The group sizes made sense theoretically and were used to evaluate whether the model in Fig. 2 varied based on students' perceptions of course ease.

To determine whether the model in Fig. 2 varied across class difficulty categories, we fit the model to each group and evaluated the model fit (see Table 6). Based on the likelihood ratio (LR) test, the model that was allowed to vary across each of the three latent classes for course ease fit significantly better than the initial baseline model (that was not allowed to vary across latent classes),  $\chi^2(242) = 798.10, p < .001$ .

**Table 5**  
Latent Class Membership of a Three-Class Solution

Class ease	Observations	Probability	SE	95% Confidence interval	
				Lower-bound	Upper-bound
Difficult	203	.14	.02	.11	.19
Moderate	906	.61	.02	.58	.64
Easy	337	.25	.02	.21	.28



**Table 6**  
Model Comparison of the Baseline Model With and Without Ease Latent Classes

Model	LR $\chi^2$	df	AIC	BIC
Baseline	.	118	94,700.4	95,301.4
Baseline + Ease classes	798.10***	242	94,150.3	95,382.9

Additionally, the AIC statistic was lower, which also indicates a better model fit. However, the BIC statistic for the baseline model without ease classes was slightly lower, indicating that the baseline model fit the data better.

Table 7 includes the direct and indirect path coefficients of the MUSIC variables and cost predicting effort and grades across course ease latent classes, as well as the latent trait means of the MUSIC variables and cost. The invariance of direct path coefficients was tested across the course ease latent classes. The direct path coefficients were significantly different across latent classes,  $\chi^2(12) = 34.07, p < .001$ . Examining specific paths, the prediction of effort by success and cost were significantly different across ease classes,  $\chi^2(2) = 9.67, p < .01$  and  $\chi^2(2) = 8.12, p < .05$ , respectively. Specifically, the prediction of effort by success was significant, positive, and significantly higher for students who thought the course was easy than for students who thought the course was difficult or moderately difficult. In contrast, the prediction of effort by cost was significant, negative, and significantly lower for students who thought the course was more difficult than for students who thought the course was moderately difficult or easy. The prediction of final grades by effort was significant and positive across all ease classes, but markedly higher for students who thought the course was easy than for students who thought the course was difficult or moderately difficult  $\chi^2(2) = 7.98, p < .05$ . Although other paths varied across the ease classes, no other paths were significantly different.

Examining the indirect path coefficients to grades (see Table 7), neither empowerment nor usefulness were significant predictors across ease classes. Success had a significant, negative, indirect prediction of grades only for students who thought the course was easy,  $\beta = -0.06, p <$

**Table 7**  
Direct and Indirect Path Coefficients Across Course Ease Classes with Wald Test of Invariance and Latent Trait Means

Effect	Path	Course ease			Invariance Wald Test $\chi^2$	
		Difficult	Moderate	Easy		
Direct $\beta$	eMpowerment → Effort	-0.09	-0.13 <sup>a</sup>	0.27	4.44	
	Usefulness → Effort	-0.04	0.09	0.07	0.75	
	Success → Effort	-0.03	0.09	-0.35**	9.67**	
	Interest → Effort	0.40*	0.32***	0.49***	2.52	
	Caring → Effort	0.19	0.37***	0.27**	1.54	
	Cost → Effort	-0.30**	0.04	0.06	8.12*	
	Effort → Grades	0.12***	0.11***	0.16***	7.98*	
	Indirect $\beta$	eMpowerment → Grades	-0.01	-0.02	0.04	-
		Usefulness → Grades	0.00	0.01	0.01	-
Success → Grades		0.00	0.01	-0.06*	-	
Interest → Grades		0.05*	0.04**	0.08**	-	
Caring → Grades		0.02	0.04***	0.04*	-	
Cost → Grades		-0.03*	0.00	0.01	-	
Latent Mean $\mu$		eMpowerment	0	0.39***	0.79***	-
		Usefulness	0	0.06	0.12	-
		Success	0	0.60***	1.13***	-
	Interest	0	0.35**	0.45***	-	
	Caring	0	0.04	0.12	-	
	Cost	0	-0.56***	-0.44***	-	

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

<sup>a</sup> This parameter was trending at  $p = 0.062$ .

.05. Interest had a significant, positive prediction of grades across ease classes. Caring had a significant, positive, indirect prediction of grades for students who thought the course was moderately difficult or easy, but not for students who thought the course was difficult. Cost had a significant, negative prediction of grades for students who thought the course was difficult,  $\beta = -0.03, p < .05$ .

Examining the latent trait means (see Table 7), there were significant differences between students who thought the course was difficult and students who thought the course was moderately difficult or easy. Almost all latent means were significantly different for students who thought the course was difficult compared to students who thought the course was moderately difficult or easy. For example, students who thought the course was moderately difficult had 0.39 standard deviations more empowerment than students who thought the course was difficult, and students who thought the course was easy had 0.79 standard deviations more empowerment than students who thought the course was difficult. There were no significant differences among usefulness of the course or caring of the instructor across ease classes.

Table 8 provides the model fit statistics for the overall model and, in some cases, the different levels of course ease. For students who thought the course was difficult, moderately difficult, and easy, the MUSIC variables and cost accounted for 26.0%, 44.3%, and 58.8% of the variance in effort, respectively, which represents large effects. For students who perceived the course to be difficult, moderately difficult, and easy, the MUSIC variables, cost, and effort accounted for 1.3%, 1.3%, and 2.7% of the variance in grades, which are small effects, but non-negligible.

The fit indices provide a mixed view of the model fit. The RMSEA (0.059 < .10) was good [41], and the CFI was about 0.9 which indicates a reasonable (but not ideal) value [38]. However, none of the SRMR statistics were acceptable (they were greater than 0.10). The BIC statistic, which penalizes model complexity, was higher than the baseline model, indicating poorer model fit. However, the AIC statistic was lower than the baseline model, indicating better model fit. Based on all these fit statistics, the baseline model with course ease latent classes fit acceptably well and provided much more information about the ease of course interactions than the baseline model.

## 5.2. Qualitative findings

We coded the responses from 200 randomly selected students to the open-ended item that asked them why they put forth effort in the course. We developed nine coding categories and grouped them into two themes: responses related to why students put forth effort and responses related to why students did not put forth effort. The coding categories and response frequencies are provided in Table 9 and grouped by students who perceived the course to be difficult, moderately difficult, and easy.

## 6. Discussion

### 6.1. Research Question 1: Overall Model Fit

Our first research question was: To what extent do undergraduate students' MUSIC perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) and cost beliefs in an online course predict their effort and achievement in the course? Based on several fit indices, we determined that the data fit the model adequately, as shown in Fig. 2, indicating that students' MUSIC perceptions were positively related to their effort, and effort was positively related to their achievement. These findings are consistent with prior studies (e.g., [21]) and provide further evidence to support the model in another context (i.e., an online course). The implication of this findings is that increasing students' MUSIC perceptions should lead to an increase in their effort and achievement. Future research could examine which teaching strategies are most likely to lead to increases in students' MUSIC perceptions

**Table 8**  
Overall Model Fit Statistics of the MUSIC Model and Cost Predicting Effort and Final Grades Moderated by Course Ease

Course Ease	n	Effort R <sup>2</sup>	Grades R <sup>2</sup>	AIC	BIC	RMSEA (LB, UB)	CFI	SRMR
Baseline + Ease	1,204			94150.3	95382.9	0.059 (0.057, 0.061)	0.897	0.161
Difficult	173	0.260	0.013					0.212
Moderate	756	0.443	0.013					0.109
Easy	275	0.588	0.027					0.146

**Table 9**  
Response Percentages and Frequencies for Each Effort Code and Ease Category

Effort codes	Course ease			Total
	Difficult	Moderate	Easy	
Why students put forth effort				
Want to receive a good grade	64.1% (25/39)	43.1% (73/169)	41.2% (21/51)	45.9% (119/259)
The course or material is interesting or enjoyable	5.1% (2/39)	13.6% (23/169)	11.8% (6/51)	12.0% (31/259)
Want to learn the material because it's relevant to their life	7.7% (3/39)	7.7% (13/169)	3.9% (2/51)	6.9% (18/259)
Not applicable or didn't answer the question	0% (0/39)	7.7% (13/169)	3.9% (2/51)	5.8% (15/259)
Want to finish the course quickly	5.1% (2/39)	4.7% (8/169)	7.8% (4/51)	5.4% (14/259)
Why students did not put forth effort				
Don't have the time because of other courses	10.3% (4/39)	10.7% (18/169)	9.8% (5/51)	10.4% (27/259)
Course was easy, or not much time needed to study	2.6% (1/39)	4.7% (8/169)	17.6% (9/51)	6.9% (18/259)
Busy personal schedule, or want time for activities outside of course	5.1% (2/39)	7.1% (12/169)	3.9% (2/51)	6.2% (16/259)
Other	0% (0/39)	0.6% (1/169)	0% (0/51)	0.4% (1/259)
Total	100% (39/39)	100% (169/169)	100% (51/51)	100% (259)

(see [6], for suggestions).

It is noteworthy that students' perceptions of the MUSIC components and cost explained 43% of the variability in effort. The model was less successful in predicting students' achievement, as the variables explained only about 2% of the variability in achievement. In contrast, Jones and Carter [21] explained about 6% of the variance in their "learning" variable without including the cost variable in their model. It is possible that the learning measure used in that study more accurately assessed students' increase in knowledge, as compared to the overall course grade used in the present study. Nonetheless, the magnitude of the relationship between effort and achievement in the present study ( $\beta = .13$ ) is typical of  $\beta$  values documented in other studies between engagement and achievement (Reeve et al. [42] noted that  $\beta$  values typically range from 0.00 to 0.30).

Only interest and caring were significant predictors of effort when all of the MUSIC and cost variables were included in the model. Similarly, only interest and caring were indirect predictors of achievement. The findings from the qualitative analysis also revealed that students reported that they put forth effort because the course or material was interesting or enjoyable. These findings highlight the importance of interest and caring in this online course and they replicate the findings from Jones [10] that also demonstrated statistically significant relationships between students' interest and effort, and their caring and effort in an online course. Although these findings may not be generalizable to all online courses, this study provides more evidence of the importance of these variables in at least some online courses. The generalizability of these findings could be tested by collecting data in many different online courses and comparing the results across courses.

Although caring was a significant predictor of effort in the quantitative analysis, it was not noted by students in the qualitative findings as a reason they put forth effort in the course. Caring has been found to be an important motivator for students in many different studies [18,19, 43]; therefore, it is not unexpected that caring predicted effort in the quantitative analysis of the present study. For the open-ended item in this study, students may be unaware of the importance that instructor caring had on their effort. Future research could examine the extent to which students are aware of the importance of instructor caring and why they may not identify it as a reason for their effort in a course even

though it is statistically related to it.

Although all of the MUSIC variables and the cost variable were statistically significantly correlated with effort (see Table 2), some of the variables (i.e., empowerment, usefulness, success, and cost) were not statistically significant predictors of effort in the full model (see Fig. 2). The reason for this finding was that in the full model, the variance explained in effort was shared with all of the variables; and thus, only variables that accounted for unique variance in effort were identified as statistically significant predictors of effort. Because the correlations among the MUSIC and cost variables were statistically significant, the amount of unique variance predicting effort was not statistically significant for some variables (i.e., empowerment, usefulness, success, and cost). For example, empowerment was statistically significantly correlated with interest ( $r = .63$ ), and it may be that providing students with empowerment/autonomy leads to increases in their interest, as has been demonstrated in other studies (e.g., [44]). Future research could test this hypothesis directly by examining the variables in different relationships with one another (e.g., empowerment predicting interest, which then predicts effort). Similarly, the reason that usefulness was not a statistically significant predictor of effort in the full model was that it was statistically significantly correlated with the MUSIC and cost variables. The relationship between success and effort and between cost and effort varied based on students' perceived ease of the course, and we discuss these relationships in the next section.

6.2. Research question 2: Variations by ease of course

Our second research question was: In what ways does the model in RQ1 vary as a function of students' perceived ease of the course? We found that the effects of MUSIC perceptions and cost varied by perceived ease of course in two significant ways. First, students who perceived that they could succeed put forth less effort if they believed that the course was easy (as evidenced by the statistically significant direct effect value of -0.35 for success shown in Table 7). There was no significant correlation between students' success perceptions and effort when students believed that the course was moderately difficult or difficult. The second way in which the model varied was that students who perceived the cost to be high (i.e., perceived that the course took a lot of time) put forth less

effort if they believed that the course was difficult (as evidenced by the statistically significant direct effect value of  $-0.30$  for cost shown in Table 7). There was no significant correlation between students' perceptions of cost and effort if students believed that the course was moderately difficult or easy.

Taken together, these two significant findings highlight two conditions in which students put forth less effort: (1) when they believe that they can succeed and the course is easy, and (2) when they believe it is going to take a lot of time and the course is difficult. Evidence for both of these conclusions was also provided through the qualitative findings. The first condition was supported through the finding that 17.6% of students in the "easy" group reported that they did not put forth effort because the course was easy, as compared to only 4.7% of students in the "moderately difficult" group and 2.6% of students in the "difficult" group (see Table 9). The second condition was supported through the fact that their lack of time was noted as a reason for their lack of effort. That is, about 10% of students across the three ease groups reported that they did not have the time because of other courses and about 6% of students reported that they had busy personal schedules or wanted more time for activities outside of the course (see Table 9). Thus, the qualitative and quantitative findings are consistent in that these two conditions can lead to students putting forth less effort.

Instructors cannot do much about students in the first condition (the course is easy) except make the course harder, which may not be necessary. If students are successful in the course without investing a lot of effort, then this is not a problem as long as students are meeting the course objectives. Or, perhaps the students already have much of the knowledge needed to meet the objectives prior to enrolling in the course, in which case those students should be advised to enroll in more appropriate courses. However, instructors may be able to help students in the second condition (i.e., students who believe it is going to take a lot of time and the course is difficult) by helping them to perceive the course to be less difficult (e.g., providing study guides, being more available for questions, creating supplemental online videos). Another option is for instructors to reduce the amount or difficulty of coursework to reduce the amount of time required by students. Unfortunately, doing so could lower course expectations and prevent students from meeting the course objectives. But there may be cases in which instructors are assigning too much work and the course objectives can be met with shorter or more effectively designed coursework, which might lead to increased student effort. It may also be possible to spread out the workload so that students are not required to spend a lot of time on the course activities some weeks and relatively little time on course activities other weeks. Instructors may also consider if there is a means for students to complete work after the official due dates if they are unable to complete the work during the normally scheduled time period. Researchers could study whether these types of teaching strategies lead students to put forth more effort.

For the indirect effects of the MUSIC perceptions and cost on achievement, across the three ease conditions, only the interest and caring paths were significant (see the values with asterisks in the "Indirect" row in Table 7), with the few exceptions that we note here. First, success perceptions were negatively correlated with grades if students perceived the course to be easy. For students with high success perceptions, this seems to be a case of *illusion of learning*, which refers to students who think that they have comprehended something when, in fact, they have not [45,46]. In this case, it is critical for students to receive feedback about their abilities so that they can learn that they do not know as much as they think they know. Instructors can consider a variety of strategies to provide more feedback, including giving more assignments, exams, or other opportunities for students to use their knowledge (e.g., ungraded practice assignments). Second, caring was not indirectly related to achievement for students who perceived the course to be difficult. Thus, caring predicts grades up to the point at which students perceive the course to become too difficult. At that point, more caring does not improve achievement. The third exception was

that students who believed the cost was high received lower grades if they believed that the course was difficult. This situation is similar to the one described for the direct effect of cost on effort in that when students thought the course took too much time, they did not invest as much effort and did not achieve as highly.

Finally, the mean values for three of the five MUSIC components and cost varied across the ease conditions (see the "Latent Mean" row in Table 7). Students who thought that the course was difficult reported lower levels of empowerment, success, and interest (and higher levels of cost) than those who thought the course was easy or moderately easy. Students reported similar levels of usefulness and caring across all three ease of course conditions. Students who thought the course was difficult were less empowered, successful, and interested than students who thought the course was easy or moderately easy.

### 6.3. Research Question 3: Reasons students put forth effort

Our third research question was: What do students perceive to be the costs and benefits of putting forth effort in an online course? The beneficial reasons for why students put forth effort were consistent with the usefulness component of the MUSIC model, the interest component, or they provided a practical reason for putting forth effort (i.e., they wanted to receive a good grade or they wanted to finish the course quickly). Related to usefulness, students reported putting forth more effort because they wanted to learn the material due to the fact that it was relevant to their life (i.e., it was *useful* to them). Related to interest, students reported putting forth effort was because the course or material was *interesting*.

The reasons that students chose *not* to put forth effort were aligned with the costs in doing so. The costs were that they did not have the time to spend on the course due to the time they needed to spend in other courses (i.e., outside effort cost), and they wanted to use their time to engage in other activities outside of the course (i.e., loss of valued alternative cost). Students did not report the other two types of cost identified by Flake et al. [22]: that the class required too much effort (i.e., task effort cost) or that the class was too stressful (i.e., emotional cost). We conclude, therefore, that the difficulty level of the course was appropriate; a conclusion that is also supported by the fact that students rated the ease of the course near the middle of the scale (they rated it a 3.86 and the middle is 3.50). The other reason they did not put forth effort was that the course was easy, so they did not need to spend much time studying.

In comparing the results in Table 9 across levels of perceived ease of course (i.e., difficult, moderate, or easy), the percentage of students reporting the reasons across levels is fairly similar. One difference is that students who perceived the course to be more difficult were more likely to indicate that they put forth effort because they wanted to receive a good grade. Another difference is that students who perceived the course to be easy (based on the quantitative scale items) were more likely to report on the open-ended item that they put forth less effort because the course was easy. This finding demonstrates that there is consistency across the quantitative and qualitative findings.

Overall, the qualitative findings may help to explain why students' MUSIC perceptions and effort were not stronger predictors of their effort or final course grades. Although some of the reasons cited by students in the qualitative findings align with their MUSIC and cost perceptions, some of the reasons were the result of practical considerations, such as putting forth effort to receive a good grade or to finish the course quickly. Future studies could use these effort codes on a questionnaire as closed-ended options to allow students to choose which reasons were relevant to them. Doing so may provide a more complete assessment because the open-ended item in the present study required students to provide responses from their memory and they may not have thought of some of the reasons that were provided by other students (see Table 9).



## 7. Limitations and directions for future research

One of the limitations to the generalizability of the findings is that we only surveyed students in one course. It is possible that the relationships between students' MUSIC perceptions, effort, and achievement are somewhat different in other types of courses. Future studies could compare these results to those in other types of courses, such as STEM (science, technology, engineering, and mathematics) courses. Alternatively, researchers could design studies to assess the patterns of students' perceptions over many different courses to determine whether they were similar or different. For example, Wilkins et al. [47] documented that students' MUSIC perceptions varied across undergraduate mathematics courses.

Another limitation of this study is that students' perceptions were measured at the course level near the middle of the course, which required students to aggregate their perceptions across different aspects of the course at that time in the course. For example, the general structure of the course assignments (e.g., students could complete as many assignments as they wanted to) likely affects students' perceptions of autonomy/empowerment. Yet, within the coursework, students' perceptions of autonomy likely vary, and our measures did not allow us to capture the nuanced nature of how students' autonomy perceptions can change across course activities [48]. Furthermore, these perceptions may be different near the beginning or end of the course (as opposed to the middle of the course). Future research could examine which aspects of the coursework were most prevalent in affecting students' effort and achievement, and investigate how students' perceptions change over time during the course.

Because interest and caring were the two most significant predictors of effort, it would be useful to instructors to understand which aspects of the instructional methods students deemed to be most interesting and fostered caring. Prior studies have documented several things that instructors can do to make online courses more interesting (e.g., showing videos, using interactive activities, varying assessments, using real-life examples, providing opportunities for applications) and to increase students' perceptions of caring (e.g., providing more opportunities for interactions between students and the instructor, sending emails about course-related topics, increasing interactions among students) [49]. Similar research methods (e.g., the use of open-ended items) and other ones (e.g., interviews) could be used in other online courses to assess the effects of instructional strategies on students' interest and perceptions of caring.

## 8. Implications and Conclusion

Our findings can be summarized briefly in the order of our three research questions. Related to our first research question (To what extent do undergraduate students' MUSIC perceptions and cost beliefs in an online course predict their effort and achievement in the course?), our findings build on those of Jones and Carter [21] to demonstrate that students' MUSIC perceptions predict their effort and achievement in an online class. Furthermore, students' interest and perceptions of instructor caring predicted their effort and achievement when included in the full model. Other studies have also documented the importance of interest and caring student-teacher relationships in supporting students' academic engagement [10,19,50]; and therefore, these relationships are not necessarily surprising, but they confirm the importance of students' interest and caring perceptions in an online course. One implication is that instructors of similar online courses should design their courses to create situational interest and foster caring relationships to improve student effort.

What may be more surprising based on prior research is that perceptions of empowerment, usefulness, and success were not significant predictors of students' effort when interest and caring were also included in the statistical model. Empowerment/autonomy, usefulness, and success are key constructs in many current motivation

theories—such as social cognitive theory [51], situated expectancy-value theory [24], and self-determination theory [52]—and recent empirical studies have documented relationships between these constructs and students' engagement and achievement (e.g., autonomy and engagement [53–55]; success perceptions and achievement [53, 56]). Findings in the present study indicate that researchers who include only some of the MUSIC constructs in their studies may not be considering all of the important variables in their study. For example, if researchers had identified self-efficacy (success perceptions) as an important predictor of students' effort, they may not be telling the entire story if they did not also include variables related to students' interest and level of caring relationship with the instructor. Therefore, our findings suggest that researchers should include constructs that relate to different aspects of students' motivation and engagement to more fully understand the dynamics of the relationships among students' course perceptions. These types of studies could also help to identify which aspects of the constructs overlap. For example, although about 50% of the variance was shared between usefulness and situational interest ( $r = .71$ ;  $r^2 = .50$ ), our study was not designed to identify which aspects of the constructs overlap.

Related to our second research question (In what ways does the model in the first research question vary as a function of students' perceived ease of the course?), students who perceived that they could succeed put forth less effort when they believed that the course was easy. This finding adds to other findings that have found students' success expectancies to moderate the effects of motivation-related constructs [25,26]. These findings point to the importance of studying interactions among motivation-related constructs. We also documented that students who perceived the cost to be high put forth less effort if they believed that the course was difficult. Researchers may be able to implement interventions aimed at students with these beliefs to help them avoid reducing their course effort in these conditions.

Findings related to our third research question (i.e., What do students perceive to be the costs and benefits of putting forth effort in an online course?) were consistent with two of the four costs identified by Flake et al. [22]: outside effort cost and loss of valued alternative cost. Thus, our results provide support for these two different types of costs in an online course. These findings also suggest that instructors can avoid the other two types of cost (i.e., task effort cost and emotional cost) if they design their online courses at an appropriate level of difficulty.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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