



Relationships between students' course perceptions, engagement, and learning

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Abstract

The purpose of this study was to examine the extent to which college students' perceptions of a course predicted their engagement and, subsequently, their learning in the course. This study is needed because relatively few studies have examined the relationships between several different class perceptions, engagement, and learning (as opposed to achievement). Understanding which class perceptions are significantly related to engagement and learning could help instructors design interventions to increase those perceptions. Participants included 355 students in a psychology course at a large, public university in the southeastern U.S. Students completed an online survey about their course perceptions, behavioral engagement, and cognitive engagement. In class, students completed a pretest and final exam that was used to calculate a learning score. We tested hypothesized path models that included measures of students' class perceptions, engagement, and learning and confirmed that students' class perceptions were not directly related to their learning; but instead, their class perceptions predicted their engagement, which then predicted their learning. Students' perceptions of empowerment (i.e., their ability to have choices and make decisions) and the extent to which the course content was useful to their goals were particularly important in predicting their cognitive engagement. An implication of these findings is that if instructors want to increase students' cognitive and behavioral engagement, they could use strategies that would lead to increases in students' perceptions of empowerment and usefulness.

Keywords Engagement · Academic motivation · Effort · Learning · MUSIC Model of Motivation

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1 Introduction

Students' perceptions of a class are important because these perceptions can affect their engagement, which is related to important outcomes such as learning and achievement (Christenson et al. 2012a; Wentzel and Miele 2016). Although many class perceptions have been shown to be related to many different motivation and engagement constructs (as described in the next section), more research is needed to examine which class perceptions are most highly related to engagement and learning in different contexts. The purpose of this study was to examine a variety of students' class perceptions and the extent to which these perceptions affect students' engagement and learning in a college psychology course. This study is needed because relatively few studies have examined the relationships between several class perceptions, engagement, and learning (as opposed to achievement). Furthermore, this study assessed class perceptions that can be linked directly to categories of teaching strategies; and therefore, the findings could help instructors target the categories of strategies that are most directly related to students' engagement and learning.

2 Literature review

2.1 Engagement and its antecedents and consequences

Engagement is a multifaceted construct that has been conceptualized in a variety of ways by different researchers (Christenson et al. 2012a). However, four dimensions of engagement have been studied most frequently: behavioral, cognitive, emotional, and agentic engagement (Fredricks et al. 2004; Reeve 2013; Sinatra et al. 2015; Skinner and Pitzer 2012). Behavioral engagement often includes effort, intensity, persistence, and perseverance in the face of difficulties. Cognitive engagement refers to students' attention, concentration, focus, and use of effective learning strategies. Emotional engagement includes affective reactions in the classroom such as enthusiasm, enjoyment, fun, anxiety, and boredom. Students who exhibit agentic engagement ask questions, tell their teacher what they like and do not like, and express their preferences and opinions (Reeve 2013).

Many researchers conceptualize motivation as an antecedent to engagement, such that motivation can be viewed as one's intentions, and engagement can be viewed as one's actions (Christenson et al. 2012b). In addition, students' perceptions of their class environments serve as antecedents that can affect their engagement in the classes (Jones 2018; Schunk et al. 2014; Urdan and Schoenfelder 2006). Studies of college students have documented positive relationships between several different student class perceptions (i.e., autonomy/empowerment, usefulness, success, interest, and caring) and behavioral engagement (Jones 2010; Jones et al. 2014, 2019; Jones and Skaggs 2016) and cognitive engagement (Jones et al. 2017). Studies of younger students have documented similar results (Patall

et al. 2018). For instance, in a study of high school students, researchers found that when students perceived higher levels of interest during science class, they were more likely to report higher levels of behavioral, cognitive, and agentic engagement (Patall et al. 2016). In another study, when middle school students reported higher levels of mathematics self-efficacy and value, they reported lower levels of disengagement in mathematics (Martin et al. 2012).

Engagement has been shown to predict many different types of outcomes, ranging from those associated with engagement with school (e.g., dropout prevention, high school completion) to outcomes related to engagement with specific activities, such as learning and academic achievement (Reschly and Christenson 2012; Skinner and Pitzer 2012). At the class-level, researchers often examine the effects of class engagement on achievement and use test scores or grades as the measure of achievement (Finn and Zimmer 2012). For example, Muenks et al. (2017) predicted college students' grades with cognitive and behavioral engagement, and Reeve (2013) predicted students' college grades using measures of behavioral and agentic engagement. In a study of younger (i.e., fifth-grade) students, researchers showed that reading engagement led to reading comprehension (De Naeghel et al. 2012). These types of studies demonstrate why engagement is important: it predicts important educational outcomes, such as grades.

Although originally designed to help teachers understand instructional strategies that can be used in courses to motivate students, the MUSIC[®] Model of Motivation (Jones 2009, 2018) also provides a framework for understanding how the antecedents and consequences of engagement are related. A simplified version of the MUSIC model is presented in Fig. 1. A strength of the MUSIC model is that it explains how students' perceptions in a course affect their motivation, which then affects their engagement and outcomes (e.g., learning, performance). Of central importance in the MUSIC model is the idea that instructors can select teaching strategies that positively affect students' class perceptions related to empowerment, usefulness, success, interest, and caring.

The five key principles of the MUSIC model are that students are more motivated when they perceive that they are *empowered* to make choices and decisions, they perceive that the content or activities are *useful* to their goals in life, they believe that they can be *successful* in the class or class activities, they are *interested* in the

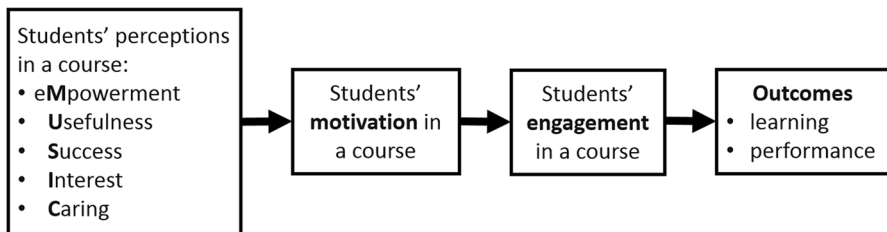


Fig. 1 Simplified representation of the MUSIC[®] Model of Motivation. From "Motivating Students by Design: Practical Strategies for Professors" by Jones (2018). Copyright 2018 by Brett D. Jones. Adapted with permission

class topics or activities, and they feel *cared* for by the teacher and other students in the learning environment. These principles are based on the research and theories of many researchers, including caring-related theories (Wentzel 1997), expectancy-value theory (Wigfield and Eccles 2000), goal orientation theories (Ames 1992), goal theories (Locke and Latham 2002), interest theories (Hidi and Renninger 2006), self-determination theory (Deci and Ryan 2000), self-theories of intelligence (Dweck 1999), social-cognitive theory (Bandura 1986), among others (see Jones 2018 for a more complete list). Therefore, the MUSIC model does not introduce new motivation constructs. Instead, it integrates ideas from these well-researched theories in a way that is more comprehensive than some other approaches.

The MUSIC model can be used to assess students' class-level perceptions, which is often not the case with other motivation theories that (a) assess more enduring beliefs about particular domains (e.g., psychology, mathematics) or (b) assess students' motivation-related traits. Furthermore, students' perceptions of the five MUSIC components can be linked to teaching strategies that instructors can use to increase students' perceptions related to these five components. For example, if students rate their empowerment perceptions in the class as low, instructors can select strategies to increase students' empowerment, such as by giving students more choices (for more examples, see Jones 2009, 2018).

2.2 Students' MUSIC perceptions in class

Researchers have documented that students' class perceptions related to empowerment/autonomy, usefulness, success, interest, and caring (hereafter titled students' "MUSIC perceptions") are distinguishable. For example, factor analyses have shown that students' class MUSIC perceptions are distinct in samples of (a) undergraduate students in the US (Jones et al. 2014, 2016; Jones and Skaggs 2016; Jones and Wilkins 2013; Tendhar et al. 2017), China (Jones et al. 2017), Colombia (Jones et al. 2017), and Egypt (Mohamed et al. 2013); (b) pharmacy students (Pace et al. 2016) and veterinary medicine students (Jones et al. 2019) in the US; (c) medical science students in Iran (Manee et al. 2017); (d) middle and high school students in the US (Chittum and Jones 2017; Parkes et al. 2017) and Iceland (Schram and Jones 2016); and (e) elementary school students in the US (Jones and Sigmon 2016).

Because students' MUSIC perceptions are distinguishable in a class (regardless of grade or culture), it raises the question: Which MUSIC perceptions are most closely related to students' engagement and learning when all five perceptions are included in one statistical model? Abundant evidence suggests that each of the five MUSIC perceptions are significantly correlated with students' engagement (Jones 2010; Jones et al. 2014, 2017; Jones and Skaggs 2016), but less is known about how all five of MUSIC perceptions interact to serve as predictors of engagement in a particular class (e.g., Jones et al. 2014). Testing all five MUSIC perceptions in one model can allow researchers to statistically control for the other four MUSIC perceptions to determine which perceptions are most significantly related to students' engagement. For example, Jones et al. (2014) found that only empowerment, usefulness, and interest predicted college engineering

students' behavioral engagement in a first-year engineering course. It is unknown whether this pattern of MUSIC perception predictors is similar in other courses.

3 Purpose and research question

Most studies that measure achievement-related outcomes use students' exam grades or course grades as the measure of achievement. Because achievement can be influenced by a variety of variables, including students' prior knowledge, we used student *learning* as our outcome variable. By measuring learning instead of achievement, we were able to assess the knowledge that students learned during the course. The purpose of our study was to test the extent to which students' MUSIC perceptions in a class predicted their engagement and their learning in a course. Our specific research question and hypotheses were as follows.

Research Question To what extent do students' MUSIC perceptions (i.e., perceptions of empowerment, usefulness, success, interest, and caring) in a psychology class predict their engagement and learning in the class?

Hypothesis 1 Students' MUSIC perceptions will not relate directly to their learning.

Hypothesis 2 Students' MUSIC perceptions will relate positively to their behavioral engagement, and behavioral engagement will relate positively to student learning.

Hypothesis 3 Students' MUSIC perceptions will relate positively to their cognitive engagement, and cognitive engagement will relate positively to student learning.

Our hypotheses are based on studies demonstrating positive relationships between students' class perceptions as antecedents to engagement, and achievement as a consequence of engagement (as explained in the previous section). Our hypotheses are also based on studies that have modeled engagement as a mediator between students' class perceptions and achievement. For example, in a college anatomy course, researchers found that students' affective reactions in a class predicted their behavioral disengagement, which then predicted their achievement on an exam (Robinson et al. 2017). In another study of adolescents in mathematics class, students' perceptions of usefulness of mathematics class content predicted their harmonious passion, which predicted their intrinsic motivation towards knowledge, which then predicted their final course grades in mathematics (Ruiz-Alfonso and Leon 2017). In another study, middle school students' perceptions of autonomy support were related to their engagement, which then predicted their achievement (Jang et al. 2012). Although these studies are similar to our study, none of these studies used the variety of class perceptions included in our model or used learning as their outcome variable (they used grades as a measure of achievement).

4 Method

4.1 Participants

Participants were recruited from an Introductory Psychology lecture course at a southeastern university. Students completed an online questionnaire before they completed the pretest and final exam measures. Of the 552 students who completed the questionnaire, 355 students agreed to allow their responses to be included in our study. Of the students who completed all the measures for the study, 69.4% were female, 76.1% were White, 9.1% were Asian/Pacific Islander, 5.3% were Hispanic/Latino, 3.1% were Black/African-American, and 0.5% were Native American. The sample included freshmen (63.6%), sophomores (26.3%), juniors (7.2%), and seniors (2.9%). The mean age of the sample was 18.7 years ($SD=0.98$). Most of the participants (93.1%) were not psychology majors.

4.2 Measures

All of the measures presented in this section, except for the learning score, were completed by students in an online questionnaire that students completed between Week 8 of class and the week before the final exam (Week 13). We used self-report items on the questionnaire because we were assessing students' class perceptions, which could not be obtained directly through observations, and we did not want to infer their perceptions from other types of measures.

4.2.1 MUSIC perceptions

The MUSIC[®] Model of Academic Motivation Inventory (College Student version; Jones 2017a; referred to here as the MUSIC Inventory) consists of 26 items that form five scales: a five-item empowerment scale, a five-item usefulness scale, a four-item success scale, a six-item interest scale, and a six-item caring scale. Each of these scales measures students' class perceptions related to a well-known construct. The definitions and constructs are provided in Table 1.

Students responded to each item on a six-point Likert-format scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *somewhat agree*, 5 = *agree*, 6 = *strongly agree*. We averaged the items in each scale to create a mean scale score and we used all of the items as recommended in the MUSIC Inventory user guide (Jones 2017a). The complete inventory is available at Jones (2017a) and example items include the following: "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). The college student version of the MUSIC Inventory has been shown to produce reliable and

Table 1 The MUSIC inventory constructs and their definitions

MUSIC model constructs	Definitions	Related constructs
	The degree to which a student perceives that:	
Empowerment	He or she has control of his or her learning environment in the course	Autonomy (Deci and Ryan 1991)
Usefulness	The coursework is useful to his or her future	Utility value (Wigfield and Eccles 2000)
Success	He or she can succeed at the coursework	Expectancy for success (Wigfield and Eccles 2000)
Interest	The instructional methods and coursework are interesting	Situational interest (Hidi and Renninger 2006)
Caring	The instructor cares about whether the student succeeds in the coursework and cares about the student's well-being	Caring (Noddings 1992)

From "User guide for assessing the components of the MUSIC® Model of Academic Motivation," by Jones 2017a, p. 5. Copyright 2017 by Brett D. Jones. Reprinted with permission

valid scores and to correlate with other measures, as expected (Jones and Skaggs 2016; Pace et al. 2016). Reliability estimates for the scales used in the present study are presented in the results section.

4.2.2 Behavioral engagement

To measure behavioral engagement, we used the four-item Course Effort scale that assesses the amount of effort that students believe that they are putting into a course (Jones 2017b). The scale consists of four items rated on a six-point Likert-format scale: 1 = *strongly disagree*, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *somewhat agree*, 5 = *agree*, 6 = *strongly agree*. An example item is, “In this course, I put forth my maximum effort.” Jones et al. (2019) found the reliability estimates to be very good across three samples of students ($\alpha=0.87, 0.90, 0.90$).

4.2.3 Cognitive engagement

To measure cognitive engagement, we used the eight-item Self-Regulated Strategy Use scale that is part of the Student Perceptions of Classroom Knowledge-Building Scale (SPOCK; Shell and Husman 2008; Shell et al. 2005). The Self-Regulated Strategy Use scale assesses the extent of students’ behaviors and strategies associated with self-regulation, such as planning, goal setting, monitoring, and evaluation of studying and learning. An example item is, “I try to determine the best approach for studying each assignment.” Students responded on a 5-point Likert-type scale with descriptors at each point (1 = *almost never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, 5 = *almost always*). Shell and Husman (2008) documented an acceptable reliability estimate ($\alpha=0.81$).

4.2.4 Learning scores

We calculated students’ learning by using scores from a pretest and a final exam. The pretest was administered during the course eight weeks prior to the final exam and 3 weeks prior to the time when the pretest content was covered in class. The final exam was administered in class on the last day of the course. The final exam included 50 multiple-choice questions that assessed students’ knowledge about content covered during the prior eight weeks. The minimum possible score on the exam was 0 and maximum possible score was 50.

On the pretest, about half of the students received 25 questions that were the same as 25 of the 50 questions on the final exam; the other half of students received the other 25 questions that were on the final exam. Therefore, students completed a final exam that consisted of 25 questions they had answered on the pretest in addition to 25 questions that they had not answered on the pretest. We compared students’ scores on the 25 questions from the final exam that they had also answered previously on the pretest with their scores on the 25 questions from the final exam that were not included in their pretest. We found no statistically significant difference between these scores ($t=0.365, p=.715$). Therefore, completing the questions on the pretest did not help students

achieve higher scores on those same items on the final exam. As a result, we used all 50 questions on the final exam to calculate their final exam scores.

To obtain a measure of learning, we saved the deleted residuals after regressing the final exam scores on the pretest scores. This created a measure of learning by taking the final exam score and statistically controlling for the pretest score. This technique is preferable to using the difference between the final exam and pretest scores (i.e., the difference score technique) as a measure of learning because it provides an estimation of learning which measures the variability in final exam scores that are not predicted by the pretest scores (i.e., variation from the final exam-on-pretest regression line; Cronbach and Furby 1970). Therefore, this produces a true measure of learning that is independent of, rather than dependent on, pretest knowledge (Tucker et al. 1966).

4.3 Analysis and interpretation of values

We screened the data for normality (i.e., skewness and kurtosis) and outliers. Upon the presence of outliers, we examined the pattern of responses of these outliers to determine whether careless responding occurred or not. We assessed the internal consistency reliability of the two engagement scales and all of the MUSIC Inventory scales by calculating Cronbach's alpha values using SPSS (version 23).

Because the factor structure of the MUSIC inventory has already been demonstrated through confirmatory factor analysis for college students (e.g., Jones and Skaggs 2016), we analyzed the relationships via path analysis. We used LISREL 9.30 to run the hypothesized path models using the maximum likelihood estimation technique. Error variances for the MUSIC model and engagement measures were set at $(1 - \alpha)$ (σ^2). Error variance was set at zero for the learning variable, as it was the only indicator of learning. Lastly, the exogenous (i.e., MUSIC) variables were all correlated with each other in the model, as this is standard practice when conducting structural equation modeling (Kline 2011).

We used three fit indices to assess the results of the CFA: the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). Although the CFI can range between 0 and 1, values closer to 1 indicate a better fit (values above 0.90 represent reasonable fit and above 0.95 represent good fit; Hu and Bentler 1999). The SRMR also ranges from 0 and 1, but values closer to 0 indicate a better fit (less than 0.05 indicates good fit [Byrne 2001] and less than 0.10 indicates reasonable fit [Kline 2005]). Finally, the RMSEA can vary between 0 and 1 with values closer to 0 indicating better fit (values less than 0.08 indicate reasonable fit and values less than 0.05 indicate good fit; Browne and Cudeck 1993; Byrne 2001; Kline 2005).

5 Results

5.1 Descriptive statistics and correlations

Overall, the mean scores on all scales of the MUSIC Inventory were high, ranging from 4.49 to 5.02 (see Table 2). The mean scores on the engagement scales were lower for cognitive engagement ($M=3.80$) and behavioral engagement ($M=4.48$). We used PRELIS version 9.30 to calculate skewness and kurtosis of the measured variables (see Table 2) and none of the values were greater than |2|, indicating that variables were normally distributed. Furthermore, the relative multivariate kurtosis was less than two (1.147), indicating there was multivariate normality among these observed variables. The Cronbach's alpha values were all good, ranging from 0.84 to 0.90, indicating that the internal consistency reliability of the scales was acceptable.

We conducted an outlier analysis by calculating Mahalanobis distance ($df=7$, critical value=24.32). A total of four participants' scores had values greater than this critical value. However, after further examination, the scores did not appear to be the result of careless responding, but instead, they seemed to be due to a very low mean score for one or two of the MUSIC perceptions compared to high scores on the other MUSIC perceptions. Therefore, we did not remove these multivariate outliers from the dataset for the analyses.

The correlation matrix among observed variables is presented in Table 3. Relationships among the MUSIC variables range from 0.51 to 0.73 and are consistent with values documented in other studies of college students (Jones et al. 2017). For example, across a variety of college courses, Jones and Skaggs (2016) found that the correlations among the MUSIC constructs ranged from 0.46 to 0.77.

5.2 Testing Hypothesis 1

For our first hypothesis, we tested the extent to which students' MUSIC perceptions predicted their learning directly, without an engagement variable as a mediator between students' MUSIC perceptions and learning. The path model with the standardized beta paths is presented in Fig. 2. Although the overall model predicted

Table 2 Descriptive statistics and Cronbach's alpha values

	Minimum	Maximum	Mean	<i>SD</i>	Skewness	Kurtosis	α
Empowerment	1.60	6.00	4.67	0.75	-0.49	0.63	0.84
Usefulness	1.00	6.00	4.71	0.84	-0.84	1.44	0.89
Success	1.75	6.00	4.62	0.81	-0.67	0.45	0.87
Interest	1.33	6.00	4.49	0.90	-0.66	0.42	0.90
Caring	1.83	6.00	5.01	0.69	-0.82	0.91	0.85
Cog. Eng.	1.63	5.00	3.80	0.63	-0.22	0.03	0.84
Beh. Eng.	1.25	6.00	4.48	0.92	-0.49	0.21	0.89
Learning	-3.11	2.50	0.00	1.01	-0.44	0.31	-

$n=355$; *Cog. Eng.* cognitive engagement, *Beh. Eng.* behavioral engagement

Table 3 Pearson's correlation coefficients for measured variables

	1	2	3	4	5	6	7
1. Empowerment	–						
2. Usefulness	0.53**	–					
3. Success	0.61**	0.58**	–				
4. Interest	0.58**	0.73**	0.62**	–			
5. Caring	0.51**	0.52**	0.52**	0.59**	–		
6. Cog. Eng.	0.34**	0.35**	0.23**	0.33**	0.24**	–	
7. Beh. Eng.	0.31**	0.36**	0.30**	0.35**	0.23**	0.65**	–
8. Learning	0.07	0.20**	0.18**	0.17**	0.13*	0.19**	0.23**

n = 355; *Cog. Eng.* cognitive engagement, *Beh. Eng.* behavioral engagement

***p* < .01, **p* < .05 (two-tailed)

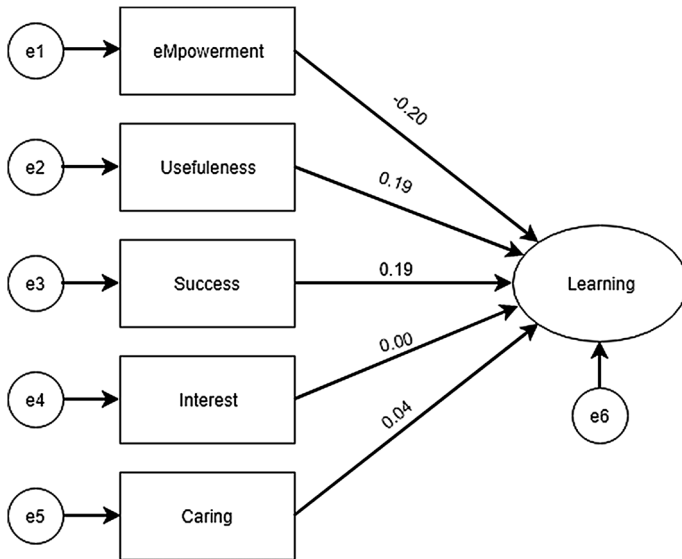


Fig. 2 Students' MUSIC perceptions did not directly predict learning. All beta weights are completely standardized (*df*=0)

6.7% of the variance in learning, none of the beta paths were statistically significant (*p* < .05). Given the somewhat large correlations between the MUSIC perceptions, the significant bivariate correlations between each MUSIC perception and learning, and the nonsignificant (and even negative) beta paths between the MUSIC perceptions and learning, we tested for multicollinearity. By regressing the learning variable on the MUSIC variables, we found that the variance inflation factors (VIF) were all between 1.70 and 2.75, which indicated that multicollinearity was not a consequential problem (because these values were less than 10, as noted in Neter et al. 1989).

5.3 Testing Hypothesis 2

Our second hypothesized model was that students' MUSIC perceptions would predict their behavioral engagement, which would predict their learning. Our analysis revealed that the data fit with the model adequately, $\chi^2 = 11.29$, $p = .046$, $df = 5$; RMSEA = 0.059; CFI = 0.99; SRMR = 0.035 (see Fig. 3). Although behavioral engagement significantly predicted learning ($\beta = 0.244$, $p < .01$), none of the MUSIC constructs significantly predicted students' behavioral engagement. We examined the squared multiple correlations (R^2) and found that the MUSIC constructs accounted for 19.3% of the variance in behavioral engagement and that behavioral engagement accounted for 5.9% of the variance in learning.

Our third hypothesized model was that the MUSIC components would predict cognitive engagement which, in turn, would predict learning. The data fit the model adequately, $\chi^2 = 13.99$, $p = .016$, $df = 5$; RMSEA = 0.071; CFI = 0.99; SRMR = 0.039 (see Fig. 4). Two MUSIC components significantly predicted students' cognitive engagement: empowerment ($\beta = 0.328$, $p < .01$) and usefulness ($\beta = 0.288$, $p < .05$). In addition, cognitive engagement significantly predicted learning ($\beta = 0.215$, $p < .01$). When examining the squared multiple correlations (i.e., R^2), we found that the MUSIC components accounted for 22.3% of the variance in cognitive engagement and cognitive engagement accounted for 4.6% of the variance in learning.

Given these findings, we made a few observations. First, two of the MUSIC components predicted cognitive engagement, but none of the MUSIC components predicted behavioral engagement. Second, behavioral engagement was a stronger predictor of learning than cognitive engagement. These findings led us to

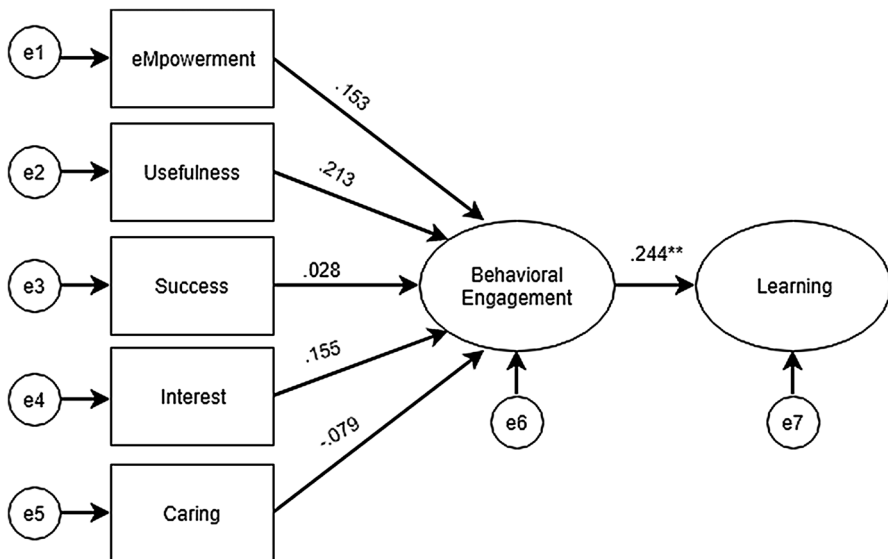


Fig. 3 Students' MUSIC perceptions predicting learning, mediated by behavioral engagement. All beta weights are completely standardized. ** $p < .01$ (two-sided)

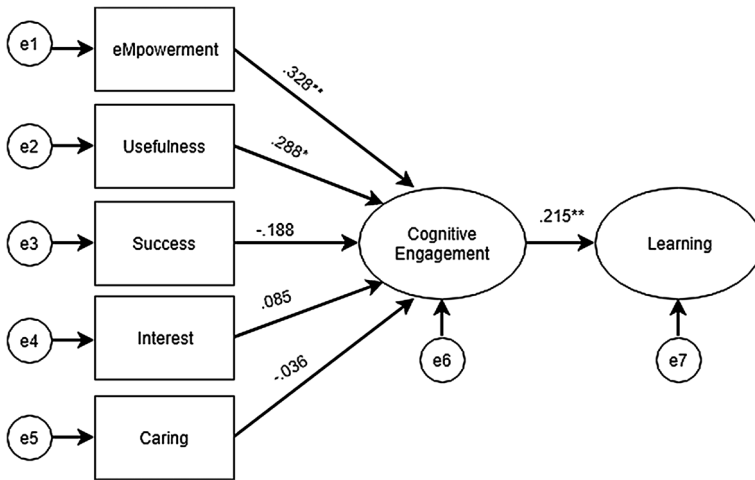


Fig. 4 MUSIC components predicting learning, mediated by cognitive engagement. All beta weights are completely standardized. * $p < .05$, ** $p < .01$ (two-sided)

hypothesize that behavioral engagement may be a mediating variable between cognitive engagement and learning. To test this hypothesis, we ran the model shown in Fig. 5 and found that the model exhibited an overall good fit with the data, $\chi^2 (11, N = 355) = 23.85, p = .013$; RMSEA = 0.057; CFI = 0.98; SRMR = 0.046.

Two MUSIC components significantly predicted cognitive engagement: empowerment ($\beta = 0.317, p < .01$) and usefulness ($\beta = 0.283, p < .05$). Furthermore, cognitive engagement significantly predicted behavioral engagement ($\beta = 0.757, p < .01$), and behavioral engagement significantly predicted learning ($\beta = 0.244, p < .01$). We examined the squared multiple correlations (R^2) and found that the MUSIC

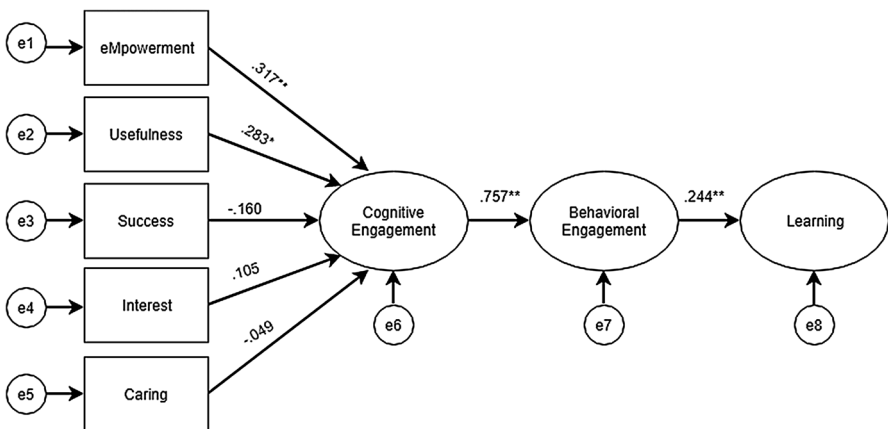


Fig. 5 Students' MUSIC perceptions predicting learning, mediated by cognitive engagement and behavioral engagement. All beta weights are completely standardized. * $p < .05$, ** $p < .01$ (two-sided)

components accounted for 23.6% of the variance in cognitive engagement. Cognitive engagement accounted for 57.3% of the variance in behavioral engagement, and behavioral engagement accounted for 5.9% of the variance in learning.

6 Discussion

The purpose of this study was to test the extent to which college students' class-level perceptions predicted their class-level engagement and, subsequently, learning in a psychology course. We began by documenting that students' MUSIC perceptions did not directly predict their learning, thus confirming our first hypothesis.

By demonstrating that the data fit our second hypothesized model, we confirmed our second hypothesis: Students' MUSIC perceptions were positively related to their behavioral engagement, and behavioral engagement was positively related to student learning. Although the data fit the model and behavioral engagement was a significant predictor of learning, it was notable that none of the MUSIC perceptions were statistically related to behavioral engagement in the path analysis. However, the Pearson correlation coefficients indicated that all of the MUSIC constructs were significantly correlated with behavioral engagement. Moreover, the five MUSIC constructs predicted 19.3% of the variance in behavioral engagement. Therefore, although no one MUSIC construct was a significant predictor, the combination of the five MUSIC constructs explained a sizable amount of variance in behavioral engagement.

A study published since the time we collected our data indicates that although course perceptions are not always related to *engagement*, these perceptions may be related to measures of *disengagement* (Robinson et al. 2017). That is, Robinson et al. (2017) showed that behavioral engagement was not strongly related to grades, but that behavioral disengagement was significantly negatively related to grades. This finding suggests that it could be worthwhile for researchers to include measures of disengagement in these types of studies in the future and that students' MUSIC perceptions may explain more variance in their disengagement.

We also confirmed our third hypothesis: Students' MUSIC perceptions were positively related to their cognitive engagement, and cognitive engagement was positively related to student learning. In this model, only perceptions of empowerment and usefulness were statistically significantly related to cognitive engagement. These findings suggest that when students feel empowered (i.e., believe that they have choices and can make decisions) and believe that the course content is related to their goals in life (i.e., useful), they are more likely to engage cognitively (i.e., use strategies such as planning, goal setting, monitoring, and evaluation of studying and learning). The finding that empowerment and usefulness predicted engagement is consistent with the results of studies that have documented relationships between autonomy support and engagement in high school students (Kaplan 2018; Patall et al. 2018). Interestingly, Kaplan measured "autonomy support" with a scale that measured, in part, the extent to which teachers allowed choice (which is consistent with the empowerment construct in our study) and provided "assistance in understanding the relevance of the studied material" (p. 237; which is consistent with the

usefulness construct in our study). Thus, our findings lend further support to the connection between students' class perceptions of empowerment/usefulness and engagement.

Some researchers have approached the study of students' perceptions of empowerment and usefulness by grouping these two constructs together with other constructs (e.g., interest, intrinsic motivation, competence, relatedness, sense of challenge, and intrinsic goals) into one construct titled "autonomy support" (Kaplan 2018; Patall et al. 2018; Su and Reeve 2011). Because our findings demonstrated that only two (i.e., empowerment and usefulness) of the five constructs measured were significantly related to engagement, we believe that measuring these constructs separately from the others may provide a more specific account of exactly how these different constructs interact with engagement. Further research is needed to determine whether separating these constructs is helpful or whether there are advantages to grouping all of these perceptions into one autonomy support construct.

The fact that success, interest, and caring were not significantly related to engagement was unexpected. Many studies have shown the importance of these three constructs. For example, self-efficacy is a key construct in social-cognitive theory (Bandura 1986) and social cognitive career theory (Lent et al. 1994), and expectancy for success is a key construct in expectancy-value theory (Wigfield and Eccles 2000). Furthermore, interest has been shown to be an important predictor of engagement and learning (Hidi and Renninger 2006), as has caring, through positive relationships between teachers and students (Wentzel 1997). Future studies could examine whether this pattern of significance is similar in other types of courses. There may have been something specific to this class, such as the grading structure or exams, which caused empowerment and usefulness to be significant predictors and not the other MUSIC perceptions.

An unexpected finding of this study was that cognitive engagement predicted behavioral engagement, which then predicted learning. We speculate that this finding can be explained as follows. Students have perceptions in the course which affect their motivation (as shown in Fig. 1, although "motivation" was not included as a separate variable in the present study). Students who are more highly motivated are more cognitively engaged, which means that they use more effective study strategies such as planning, goal setting, monitoring, and evaluating their studying and learning. Because these types of strategies likely require more effort than some other strategies (e.g., rote learning by repetition or rehearsal of information), students must put forth more effort (i.e., engage more behaviorally). These higher levels of cognitive and behavioral engagement ultimately lead to increased learning. Further studies are needed to determine the extent to which this finding is generalizable to other different types of courses with different types of students.

Although the data fit our final model well, the amount of variance in learning explained by the other variables is relatively small (5.9% of the variance in learning). This finding indicates that other variables are important in affecting students' learning. One potentially significant variable not included in our study is the *cost* of engaging in the course. Cost has been identified as an important variable related to motivation (Simpson and Balsam 2016; Wigfield and Eccles 2000). Costs can include the cost of putting forth effort in the course, the cost of not being able to do

other things when engaging in the course, and the emotional costs that result from engaging in the course (Flake et al. 2015). The MUSIC model specifies that these types of costs may detract from students' engagement in any one particular course (Jones 2018). Future studies could include measures of cost to determine the extent to which cost variables contribute to students' disengagement in a course.

7 Implications

Given that empowerment and usefulness were the only two class perceptions that were significantly related to cognitive engagement in the path models, it may be possible to increase students' cognitive engagement (and consequently learning) by increasing their perceptions of empowerment and usefulness. In fact, Hulleman et al. (2017) conducted an intervention to increase students' perceptions of usefulness in a college psychology course, which was a sample similar to the present study. These researchers manipulated students' perceptions of usefulness by encouraging one group of students to make connections between the course material and their lives. Compared to a control group, the group of students that participated in the usefulness intervention received higher grades in the course and the effect was most pronounced for the lowest-performing students. In another intervention study with college psychology students, students were more likely to rate the course as useful to their goals when they had the opportunity to discuss the usefulness of the course with other students on the first day of class (McGinley and Jones 2014).

Because empowerment was also significantly related to cognitive engagement in the present study, interventions that affect students' perceptions of autonomy may also provide a means to increase students' engagement and learning. As noted previously, when students believe that they have more autonomy/empowerment, they tend to be more engaged in classes (Patall et al. 2018). Some studies have found that it is possible to train teachers to become more autonomy supportive in ways that lead to more engaged students (e.g., Reeve et al. 2004). Because many of these studies incorporated strategies for *autonomy support* that did more than simply meet students' need for autonomy (i.e., they may have also increased interest and value), it would be necessary to understand the specific effects of students' autonomy perceptions alone to make the claim that the outcomes were due to meeting students' need for autonomy and not due to other constructs.

8 Limitations

A potential limitation with the measure of cognitive engagement in this study is that students might not rate their cognitive engagement highly for reasons other than the fact that they were not cognitively engaged. Perhaps some students did not rate their cognitive engagement highly because (a) they did not know how to use these strategies, (b) they did not know that these strategies could lead to improved learning, or (c) they did not need to use these strategies to obtain the grade they desired. However, we speculate that most of the strategies assessed by the cognitive

engagement measure in this study would likely be used by most students in the course (e.g., determining the best approach for studying, monitoring study progress, making plans for how to study, checking to see if they understand what they study, taking notes and jotting down questions when reading, focusing on understanding the important ideas in reading or studying, setting goals). Nonetheless, in the future, researchers could determine whether or not these strategies were needed by students to reach their grade goals.

Another limitation of this study is that student perceptions of the course were fairly high, ranging from 4.49 to 5.02 on a six-point scale. It would be interesting to assess the extent to which the models tested in this study varied across courses in which students' course perceptions were much lower. It is possible that some other class perceptions are more strongly related to students' engagement and learning in these types of courses.

9 Conclusion

This study provides evidence that students' class perceptions are related to their cognitive engagement, which is related to their behavioral engagement, and ultimately, their learning. Students' perceptions of empowerment (i.e., their ability to have choices and make decisions) and the usefulness of the course content to their goals in life were particularly important in predicting their cognitive engagement. An implication is that if instructors of courses similar to the one described in this study want to increase students' cognitive and behavioral engagement, they could use strategies targeted at increasing students' perceptions of empowerment and usefulness. Another conclusion is that cognitive and behavioral engagement predicted only a small portion of the variance in students' learning. Therefore, studies intended to predict students' learning need to include variables beyond those included in the present study.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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