

## **A comparison of student academic motivations across three course disciplines**

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*Abstract: Intrinsic and extrinsic motivations of undergraduate students enrolled in human anatomy and physiology, physics, and nutrition courses were explored with course discipline-specific adapted versions of the Academic Motivation Scale. Information on students' study habits and efforts, and final course grades were also collected. Results revealed the adapted versions of the Academic Motivation Scale had comparable reliabilities to previous investigations, significant differences in motivations across the students enrolled in the three courses and significant influences of motivation on academic behaviors and course performance.*

*Keywords: academic performance, self-determination theory, academic motivation scale*

### **I. Introduction.**

In an attempt to understand what factors are related to the motivation of undergraduate students, how students' motivation may contribute to their success or failure in individual courses, as well as what can be done to increase their motivation, we undertook the current study. This project investigated students' intrinsic and extrinsic motivations, as well as amotivation, while enrolled in human anatomy and physiology (HAP), physics, and nutrition courses. These three classes enroll students across many different majors, which require these courses be taken as part of the curriculum. This provides an excellent opportunity to study differential student motivation and the impact of those differences on student academic behaviors and performance.

Student motivation is a vital determinant of academic performance and achievement. It has been extensively studied in the context of global higher education. Deci and Ryan's (1985) self-determination theory (SDT) provides a theoretical framework for explaining student behavior through the understanding of student motivation. According to SDT, motivation should not be viewed as a unitary concept. Instead, SDT proposes a continuum composed of three types of motivation: intrinsic motivation (IM), extrinsic motivation (EM), and amotivation. Motivations along the continuum differ in the extent in which they are self-determined.

Intrinsic motivation represents the most self-determined type of motivation, in which activities are accomplished for the sake of enjoyment. There are three subfactors within intrinsic motivation: intrinsic motivation to know (IM-To Know), intrinsic motivation toward accomplishments (IM-To Accomplish), and intrinsic motivation to experience stimulation (IM-Stimulation). IM-To Know arises when an individual engages in a behavior for the satisfaction

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experienced while learning or trying to understand something new. IM-To Accomplish occurs when an individual engages in a behavior for the pleasure experienced while trying to accomplish a task or create something. IM-Stimulation transpires when an individual engages in a behavior in order to experience stimulating or exciting sensations.

Extrinsic motivation lies along the center of the continuum of self-determination. Extrinsic motivation represents actions taken to achieve a goal or reward beyond the activity itself. There are three subfactors included in the extrinsic motivation, listed in order here from most to least self-determined: extrinsic motivation identified (EM-Identified), extrinsic motivation introjected (EM-Introjected), and extrinsic motivation external (EM-External) forms of regulation. EM-Identified is when an individual truly values a behavior even though they are not doing it because they like it. EM-Introjected is when one engages in a behavior to maintain personal expectations or avoid guilt. EM-External is when an individual participates in an activity solely as a means to obtain an external reward or to avoid punishment.

Amotivation lies at the opposite end of the self-determination continuum from intrinsic motivation. Amotivation refers to the absence of intention and motivation.

When applied to the realm of education, SDT is primarily concerned with promoting in students a confidence in their own capacities and attributes, a valuing of education, and an interest in learning. Self-determined motivation has been linked to various education outcomes across the age span, from early elementary school to college students. Pintrich and De Groot (1990) linked intrinsic motivation and autonomous forms of extrinsic motivation to positive academic performance. Student motivation has been found to be a predictor of positive academic performance in areas including course attendance (Moore et al., 2008), course grades (Wilson & Wilson, 2007), and persistence in their program of study (Dodge et al., 2009).

Unfortunately, students are increasingly taking a consumerist approach to higher education, suggesting a shift from intrinsic to extrinsic motivations (Labaree, 1997). This is potentially problematic because students whose motivations are more intrinsic do better in school, have lower rates of withdrawal, absenteeism, and dropout, and have lower feelings of anxiety about school and higher levels of academic performance (Prospero & Vohra-Gupta, 2007). Griffin et al. (2013) recently reported the single most influential learning and study skill promoting positive academic performance is students' level of intrinsic motivation. These studies suggest examining students' motivations may be important to predicting their performance in college courses.

Considering student motivation is vital for success in college, faculties place more emphasis on motivation and attitudes towards learning as central to learning than students themselves (Lammers & Smith, 2008). Furthermore, studies have acknowledged that motivational factors are discipline-specific, and what leads to success in one field may not necessarily do so in another. Academic achievement of biology, history, computing, planning, anthropology, geology, food science and nutrition, and education students measured using a motivation questionnaire revealed that factors motivating students are specific within a discipline, and do not extend uniformly across all disciplines (Breen & Lindsay, 2002). Disciplinary differences in self-regulated learning were also noted among college students taking humanities, social science, and natural science courses (Vanderstoep et al., 1996).

In this study, we have chosen to investigate student motivation in three courses: HAP , physics, and nutrition. Few studies have researched motivations of the allied health student population, who are required to take HAP. Considering the important role of allied health professionals in society, it becomes crucial to identify these students' motivations, as they will

work directly with clients in the health field (Ballman & Mueller, 2008). In addition, examining students' motivations will be important to predicting their performance in HAP courses.

HAP courses are considered “difficult” by both faculty and students (Michael, 2007). At our institution, HAP courses are required of all allied health majors. Most students taking the classes at our institution are pre-nursing majors, although we have also noted an increase in exercise science and nutrition majors. Students taking these courses need to earn a grade of “C” or better to progress in their degree program. As more and more students enter the allied health field, the enrollment in these courses is skyrocketing. Attrition is an issue to be addressed as well: as many as 50% of the students enrolled in the class fail to earn at least a “C”, and must either retake the course, change their major, or drop out.

It has been reported previously that nursing students traditionally experience difficulties with the science subjects in nursing curricula (Andrew, 1998). Nilsson and Stomberg (2008) also found that the degree of difficulty/heavy demand on studies is one of the factors in explaining low motivations of nursing students. Salamonson et al. (2009) observed a shift from intrinsic goal orientations to extrinsic goal orientations in nursing students, including high achieving nursing students. These findings suggest that students in HAP courses may be more extrinsically motivated.

Few studies have researched the motivations of students studying physics. In one study, the Self-Determination Theory was applied to the motivational orientations of 9<sup>th</sup> grade students studying physics in Finnish-speaking comprehensive schools in Finland (Byman et al., 2012). According to this study, both IM and EM-Identified seemed to be optimal motivational orientations to physics learning. Even fewer studies have focused on the motivations of students taking physics courses at the university level. Recently, Bodin and Winberg (2012) reported on the role of beliefs and emotions in numerical problem solving in university physics education. They discovered that intrinsic motivation together with students' personal interest and utility value beliefs did not predict the quality of performance on task with many degrees of freedom. However, feelings corresponding to control and concentration, emotions that are expected to trigger students' intrinsic motivation, were important in predicting performance.

Similar to HAP courses, physics courses are considered difficult by students. At our institution, Introductory Physics courses are required for multiple majors. The student population in the Introductory Physics course is composed of approximately 50% exercise science majors, 30% construction management majors, 10% biology majors, and 10% of other majors. Also similar to HAP, attrition is an issue to be addressed, as approximately 30-40% of the students enrolled in the class fail to earn at least a “C”, with the same consequences as noted above for students taking HAP courses. Given the required nature of these courses, additional studies on the motivation of students taking these courses would be beneficial in improving student success in their major.

Research on the motivations of students in nutrition courses is even more limited and suggests these students may have different motivations from students in other majors (Breen & Lindsay, 2002). More specifically, this research reports that students taking nutrition courses seem to have primary motivations that focus on the enjoyment derived from academic activities. Although the Breen and Lindsay conceptualization of motivation does not fully overlap with the SDT model, the motivations described are definitely intrinsic, and most closely resemble IM-To Know and IM-To Accomplish.

Unlike the HAP and physics courses describe above, the nutrition courses used in this investigation are not required, are not perceived as “difficult,” and do not typically have a high

percentage of students who earn less than a “C”. If the same was true of the classes used in the Breen and Lindsay investigation, that may explain why intrinsic motivations appeared to more strongly influence student performance.

Based on this prior literature, we hypothesize:

H1: The Academic Motivation Scale used in prior research can be applied to specific courses, not just higher education globally. Specifically, reliabilities for subscales will be comparable with reported reliabilities.

H2: The Academic Motivation Scale subscales will differ significantly between students enrolled in the three course disciplines in this investigation (HAP, physics, and nutrition). Specifically, students in nutrition courses will report higher levels of intrinsic motivations and lower levels of extrinsic motivations than students in HAP and physics courses.

H3: Student motivation will influence study habits and efforts (e.g., class attendance, completion of assignments, and hours spent studying) and final course grade. Specifically, higher levels of intrinsic and extrinsic motivations will be associated with higher levels of study habits, efforts, and final grades. Conversely, higher levels of amotivation will be associated with lower levels of study habits, efforts, and final grades.

## II. Method.

### *A. Participants.*

Participants were recruited from a population of students enrolled in one of 11 sections of six different undergraduate courses at a large public southeastern university: four sections of Human Anatomy & Physiology I [HAP I], two sections of Human Anatomy & Physiology II [HAP II] and Nutrition & Health, and one section each of Physics I, Physics II, and Nutrition & Diet Therapy. A total of 806 students participated and 775 (96.2%) completed the full questionnaire: 369 in HAP I, 152 in HAP II, 79 in Nutrition & Health, 106 in Physics I, 26 in Physics II, and 43 in Nutrition & Diet Therapy. We were able to obtain final course grades for 663 (grades for both sections of Nutrition & Health were unavailable), representing 85.5% of those who completed the questionnaire.

With respect to demographic data, 67.5% of the participants (N=523) were female, 32.4% (N=251) were male, and 0.1% (N=1) did not report their gender. The majority of participants (66.2%) were White (N=513), with 26.5% (N=205) African-American, 1.9% (N=15) Hispanic, 2.2% (N=17) Asian-American, 3.0% (N=23) “Other,” and 0.3% (N=2) not reporting ethnicity. In terms of class standing, 5.2% (N=40) were freshmen, 48.5% (N=376) were sophomores, 31.0% (N=240) were juniors, 14.5% (N=112) were seniors, 0.1% (N=1) were grad students, and 0.8% (N=6) were “other.” Data for student majors is listed by course discipline in Table 1.

### *B. Materials.*

Participants received a 42-item questionnaire. The first six questions were demographic questions. The next eight questions were dependent variables and queried students about their likelihood of continuing with their major [Continue], grade point average [GPA], class attendance [Attendance], class preparation [Preparation], study time [Hours Studying], perceived level of difficulty of the class [Perceived Difficulty], overall level of motivation [Motivated], and anticipated grade in the class [Expected Grade]. These eight questions were identical to those

used in Maurer, Allen, Gatch, Shankar, and Sturges (2012). Due to IRB restrictions, it was not possible to reconcile self-reported GPA with official university records.

**Table 1. Student major by course discipline.**

Major	Course discipline					
	HAP		Physics		Nutrition	
	<i>N</i> = 520	%	<i>N</i> = 132	%	<i>N</i> = 122	%
Nursing	227	43.65%	0	0.00%	101	82.79%
Athletic Training	29	5.58%	2	1.51%	0	0.00%
Exercise Science	113	21.73%	57	43.18%	0	0.00%
Nutrition	32	6.15%	0	0.00%	0	0.00%
Health Education & Promotion; Community Health	20	3.85%	0	0.00%	4	3.29%
Health and Physical Education	16	2.31%	0	0.00%	0	0.00%
Biology/pre-med	28	5.38%	22	16.67%	2	1.64%
Chemistry	0	0.00%	2	1.52%	0	0.00%
Geology	0	0.00%	2	1.52%	0	0.00%
Computer Science	0	0.00%	6	4.54%	0	0.00%
Construction Management	0	0.00%	31	23.48%	0	0.00%
Other	59	11.35%	10	7.58%	15	12.30%

The remaining 28 questions were adapted from Vallerand et al.’s (1992) Academic Motivation Scale (AMS) following the protocol developed by Maurer et al. (2012). The AMS operationalizes SDT by measuring degrees of self-determined motivation in academic contexts. Vallerand and colleagues (1989) developed and validated the AMS for the purpose of assessing three types of intrinsic motivation (IM-To Know, IM-To Accomplish, and IM-Stimulation), three types of extrinsic motivation (EM-Identified, EM-Introjected, and EM-External), and amotivation. The AMS has been shown by Grouzet, Otis, and Pelletier (2006) to be time- and gender-invariant.

Prior investigations with the AMS have all operationalized it at the global level, referencing higher education and college attendance more generally. In this study, the AMS was adapted to apply specifically to the three course disciplines: HAP, physics, and nutrition. The AMS consists of seven subscales, each of which is assessed with four items on a seven-point Likert scale: Amotivation, EM-External, EM-Introjected, EM-Identified, IM-Stimulation, IM-To Accomplish, and IM-To Know. Reliabilities for the seven subscales in the original AMS, expressed as Chronbach’s alpha, are presented in Table 2 as “Reported alpha.”

To adapt the AMS to the three course disciplines, each of the 28 items were reworded to focus the meaning of the item on the course selected. In the original AMS, participants were instructed, “Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to college”, with response options from *Does not correspond at all* to *Corresponds exactly*. For the present study, the instructions were reworded by replacing the phrase “go to college” with the phrase “are taking this class.” A sample IM-To Know item from the original AMS read, “For the pleasure I experience when I discover new things never seen before.” In the present study, the item was reworded by replacing the phrase “never seen before” with the phrase “about the human body I’ve never seen before” (HAP), “about how the physical world works that I’ve never seen before” (physics), and “about nutrition and health that I’ve never seen before” (nutrition).

### *C. Procedure.*

The project used a non-experimental design with a convenience sample. Students in the 11 course sections were invited to participate in an in-class survey. They were given 15 minutes to complete the survey and enter their responses via clickers (i.e., classroom electronic response systems) or on special scantrons. No incentives for participation were offered and all students were free to decline participation. Final course grades were collected from course instructors after the end of the term.

## **III. Results.**

### *A. Hypothesis One.*

Reliability analyses indicated that all seven subscales of the adapted AMS had adequate internal reliability, as measured by Chronbach’s alpha, for all three course disciplines. Reliabilities were comparable to those reported for the global AMS by Vallerand et al. (1992) and to those reported for the previously adapted allied health AMS by Maurer et al. (2012) (see Table 2).

### *B. Hypothesis Two.*

Correlational analyses revealed significant correlations between the AMS subscales, so a Multivariate Analysis of Variance [MANOVA] with the three course disciplines as the categorical independent variable and the seven AMS subscales as the dependent variables was computed. A significant multivariate main effect for course discipline emerged, Pillai’s Trace = .24,  $F(14, 1534) = 15.04$ ,  $p < .001$ , partial  $\eta^2 = .12$ . Follow-up univariate ANOVAs yielded significant models for all seven AMS subscales (see Table 3). For the IM-To Know and IM-To Accomplish subscales, all three course disciplines were significantly different from one another. For IM-To Know, students in nutrition classes reported higher scores than students in HAP classes who reported higher scores than students in physics classes. For IM-To Accomplish, students in physics classes again reported the lowest scores, but this time students in HAP classes reported the highest scores. For the IM-Stimulation subscale, physics was significantly different (lower) from the other two course disciplines which were not significantly different from one another. For the remaining four subscales, HAP was significantly different from the other two courses disciplines (higher in all cases except amotivation) which were not significantly different from one another. Higher scores indicate higher levels of that type of motivation, with 16 representing the midpoint for each subscale.

**Table 2. AMS subscale reliabilities by course .**

		Course					
		HAP I	HAP II	Physics I	Physics II	Nutrition & Diet Therapy	Nutrition & Health
AMS Subscale	Vallerand et al.'s Reported Alpha	HAP		Physics		Nutrition	
IM-To Know	.84	.89		.88		.89	
IM-To Accomplish	.85	.84		.87		.84	
IM-Stimulation	.86	.87		.85		.86	
EM-Identified	.62	.80		.77		.86	
EM-Introjected	.84	.84		.91		.88	
EM-External	.83	.85		.83		.82	
Amotivation	.85	.81		.80		.79	

Note. Alpha is Chronbach's alpha.

**Table 3. AMS subscale differences by course discipline.**

AMS Subscale	<i>F</i> (2, 772)	Partial $\eta^2$	Means		
			HAP	Physics	Nutrition
IM-To Know	56.67**	.13	18.82 <sub>a</sub>	12.48 <sub>b</sub>	19.96
IM-To Accomplish	24.47**	.06	16.94 <sub>a</sub>	12.90 <sub>b</sub>	15.28
IM-Stimulation	29.21**	.07	14.50 <sub>a</sub>	9.92 <sub>b</sub>	13.79 <sub>a</sub>
EM-Identified	73.18**	.16	21.83 <sub>a</sub>	15.99 <sub>b</sub>	17.34 <sub>b</sub>
EM-Introjected	16.44**	.04	18.21 <sub>a</sub>	15.13 <sub>b</sub>	15.80 <sub>b</sub>
EM-External	11.99**	.03	21.23 <sub>a</sub>	19.13 <sub>b</sub>	18.73 <sub>b</sub>
Amotivation	6.04*	.02	8.11 <sub>a</sub>	9.52 <sub>b</sub>	9.61 <sub>b</sub>

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

Note. Means in the same row with different subscripts are different at the  $p < .01$  level. Subscale range: 4-28.

*C. Hypothesis Three.*

In addition to the correlations between the seven AMS subscales, significant correlations emerged between the nine dependent variables. As a result, a multivariate multiple regression (Generalized Linear Model) with the seven AMS subscales as independent variables and all nine

dependent variables was conducted. To facilitate data interpretation and presentation, separate models were computed for each of the three disciplines.

*HAP.* Three subscales yielded significant models: EM-Identified (Pillai's Trace = .04,  $F(9, 459) = 1.92, p < .05$ , partial  $\eta^2 = .04$ ), EM-External (Pillai's Trace = .05,  $F(9, 459) = 2.57, p < .01$ , partial  $\eta^2 = .05$ ), and amotivation (Pillai's Trace = .09,  $F(9, 459) = 5.32, p < .001$ , partial  $\eta^2 = .09$ ). Seven dependent variables yielded significant models: Continue ( $F(7, 475) = 2.41, p < .05$ , partial  $\eta^2 = .04$ ), GPA ( $F(7, 475) = 8.59, p < .001$ , partial  $\eta^2 = .11$ ), Attendance ( $F(7, 475) = 3.18, p < .01$ , partial  $\eta^2 = .05$ ), Hours Studying ( $F(7, 475) = 4.77, p < .001$ , partial  $\eta^2 = .07$ ), Motivated ( $F(7, 475) = 7.79, p < .001$ , partial  $\eta^2 = .11$ ), Expected Grade ( $F(7, 475) = 12.82, p < .001$ , partial  $\eta^2 = .16$ ), and Final Grade ( $F(7, 475) = 7.88, p < .001$ , partial  $\eta^2 = .11$ ).

EM-Identified significantly influenced likelihood of continuing with major ( $F(1, 475) = 4.58, p < .05$ , partial  $\eta^2 = .01$ ), GPA ( $F(1, 475) = 11.26, p < .01$ , partial  $\eta^2 = .02$ ), Expected Grade ( $F(1, 475) = 7.30, p < .01$ , partial  $\eta^2 = .02$ ), and Final Grade ( $F(1, 475) = 8.09, p < .01$ , partial  $\eta^2 = .02$ ). Visual inspection of means confirmed that all effects were positive linear effects such that higher levels on EM-Identified were associated with higher levels on the dependent variables (see Table 4).

EM-External significantly influenced likelihood of continuing with major ( $F(1, 475) = 4.23, p < .05$ , partial  $\eta^2 = .01$ ), GPA ( $F(1, 475) = 5.63, p < .05$ , partial  $\eta^2 = .01$ ), Attendance ( $F(1, 475) = 4.23, p < .05$ , partial  $\eta^2 = .01$ ), Hours Studying ( $F(1, 475) = 6.64, p < .05$ , partial  $\eta^2 = .01$ ), Motivated ( $F(1, 475) = 3.93, p < .05$ , partial  $\eta^2 = .01$ ), Expected Grade ( $F(1, 475) = 8.96, p < .01$ , partial  $\eta^2 = .02$ ), and Final Grade ( $F(1, 475) = 5.79, p < .05$ , partial  $\eta^2 = .01$ ). With the exception of continuing with the major and hours studying, visual inspection of means again confirmed positive linear effects. For hours studying, a curvilinear effect was revealed such that those who reported the smallest and largest number of hours studying reported lower levels of this type of motivation than those who reported around 3-6 hours studying. The results for continuing with the major did not yield an interpretable pattern.

Amotivation significantly influenced GPA ( $F(1, 475) = 19.03, p < .001$ , partial  $\eta^2 = .04$ ), Motivated ( $F(1, 475) = 16.15, p < .001$ , partial  $\eta^2 = .03$ ), Expected Grade ( $F(1, 475) = 33.63, p < .001$ , partial  $\eta^2 = .07$ ), and Final Grade ( $F(1, 475) = 18.17, p < .001$ , partial  $\eta^2 = .04$ ). Visual inspection of means revealed negative linear effects for GPA, Motivated, and Expected Grade, and a curvilinear effect for Final Grade. Those students who received Ds reported higher levels of amotivation than students who received higher or lower grades.

*Physics.* Only the amotivation subscale yielded a significant model (Pillai's Trace = .20,  $F(9, 113) = 3.24, p < .01$ , partial  $\eta^2 = .21$ ). Five dependent variables yielded significant models: Hours Studying ( $F(7, 129) = 2.25, p < .05$ , partial  $\eta^2 = .12$ ), Difficulty ( $F(7, 129) = 3.36, p < .01$ , partial  $\eta^2 = .16$ ), Motivated ( $F(7, 129) = 3.71, p < .01$ , partial  $\eta^2 = .18$ ), Expected Grade ( $F(7, 129) = 4.94, p < .001$ , partial  $\eta^2 = .22$ ), and Final Grade ( $F(7, 129) = 3.50, p < .01$ , partial  $\eta^2 = .17$ ).

Amotivation significantly influenced Difficulty ( $F(1, 129) = 12.29, p < .01$ , partial  $\eta^2 = .07$ ), Motivated ( $F(1, 129) = 9.26, p < .01$ , partial  $\eta^2 = .05$ ), and Expected Grade ( $F(1, 129) = 6.82, p < .05$ , partial  $\eta^2 = .02$ ). Visual inspection of means revealed a negative linear effect for expected grade and curvilinear effects for Difficulty (amotivation peaking at the extremes) and Motivated (amotivation peaking in the center).

*Nutrition.* Two subscales yielded significant models: IM-To Know (Pillai's Trace = .47,  $F(9, 26) = 3.24, p < .05$ , partial  $\eta^2 = .47$ ) and amotivation (Pillai's Trace = .44,  $F(9, 26) = 3.24, p < .05$ , partial  $\eta^2 = .44$ ). Two dependent variables yielded significant models: Hours Studying



( $F(7, 41) = 3.85, p < .01$ , partial  $\eta^2 = .44$ ) and Final Grade ( $F(7, 41) = 2.68, p < .05$ , partial  $\eta^2 = .36$ ).

IM-To Know significantly influenced Final Grade ( $F(1, 41) = 4.57, p < .05$ , partial  $\eta^2 = .12$ ). Visual inspection of means revealed a curvilinear effect such that students with low levels on this subscale received Cs whereas students with high levels were more likely to receive As and Fs. Amotivation did not predict either of the variables in the significant models.

**Table 4. Influence of AMS subscales on dependent variables by course discipline.**

Course discipline	Dependent Variable								
	Continue	GPA	Attendance	Preparation	Hours studying	Perceived difficulty	Motivated	Expected grade	Actual grade
HAP									
EM-Identified	Positive linear	Positive linear	—	—	—	—	—	Positive linear	Positive linear
EM-External	Uninterpretable	Positive linear	Positive linear	—	Bell-shaped curvilinear	—	Positive linear	Positive linear	Positive linear
Amotivation	—	Negative linear	—	—	—	—	Negative linear	Negative linear	Bell-shaped curvilinear
Physics									
Amotivation	—	—	—	—	—	U-shaped curvilinear	Bell-shaped curvilinear	Negative linear	—
Nutrition									
IM-To Know	—	—	—	—	—	—	—	—	U-shaped curvilinear

#### IV. Discussion and Conclusions.

This study is an extension of our previous work on motivation in allied health students (Maurer et al., 2012). It explored students’ academic motivations to better understand how motivation may contribute to students’ success in HAP, physics, and nutrition, and whether there are differences in motivation among students in these courses. Since no previous studies used the AMS across multiple course disciplines to study student motivation, this study brings a unique perspective to research in motivation.

Results obtained offered support for all three hypotheses. Our first hypothesis stated that the AMS scale could be applied to specific courses, not just higher education globally as exemplified by reliabilities comparable with those previously reported. Our data revealed that the reliabilities for all of the seven subscales of the AMS were similar to previously reported reliabilities and consistent across all three course disciplines. This suggests that the AMS can be adapted to specific courses in HAP, physics, and nutrition, with reliable results and can be used as an instrument to study motivation in these courses.

Our second hypothesis stated that the AMS subscales would be significantly different between students enrolled in the three course disciplines (HAP, physics, and nutrition). Specifically, students in nutrition courses will report higher levels of intrinsic motivations and lower levels of extrinsic motivations than students taking HAP and physics courses. Although both intrinsic and extrinsic scores were higher than amotivation scores across all three course disciplines, the data showed significant differences between intrinsic motivation and extrinsic motivation subscales. It seems that students in nutrition courses are mostly driven by IM-To

Know, HAP students are mostly driven by EM –Identified, and students in physics courses are driven by EM-External. Our results support previous research and indicate that students taking nutrition courses have predominantly intrinsic motivation. Since the nutrition class is an elective for many majors and focuses on current nutrition trends and their impact on health, it is possible that students self-select by degree of interest and can see a more direct connection between their learning and their own personal health status. In comparison to the other two course disciplines, nutrition is also considered an easier class and students perform better academically. HAP on the other hand is a required class for all allied health majors, so even though students value this class (Sturges, Maurer, and Dobson, 2012), they consider it difficult (Sturges and Maurer, 2013) and their motivation for success is reflected in high EM-Identified. This supports our previous research in HAP classes where extrinsic motivation was highest on the AMS (Maurer et al., 2012). Physics is a required class for multiple majors, including non-physics majors or even non-science majors, as students take this class to satisfy major requirements. Since physics serves as a prerequisite for future major courses, students might see less intrinsic value in the course while they are completing the course, and as such they might be more motivated to receive a passing grade than to really learn or understand the material. This could influence their primarily EM-External orientation, where students are motivated by an extrinsic reward (progressing to major) or avoiding punishment (not progressing to major).

Overall, students in all courses scored high on EM, which supports previous research findings indicating a more consumerist approach to education. It also supports our previous findings (Maurer et al., 2012) which indicate that instructors can influence students' motivation on the extrinsic motivation subscales through an attendance policy, in-class assignments and other activities, but have little control over students' intrinsic motivation.

Our third hypothesis stated that student motivation would influence study habits and efforts (class attendance, completion of assignments, and hours spent studying) and final grade. Specifically, higher levels of intrinsic and extrinsic motivations will be associated with higher levels of study habits, efforts, and final grades. Conversely, higher levels of amotivation will be associated with lower levels of study habits, efforts, and final grades. Numerous significant results emerged from this analysis. For HAP, student motivation did indeed influence final grade and multiple student study habits and efforts. The results suggest a strong influence of EM for this population. It could be that due to the position of the HAP class in the allied health curriculum, students value the class, even if they don't like it, which is seen in the positive linear effect of their GPA and expected/final grade. On the other hand, they are also driven by an extrinsic reward (progressing to major) or avoiding punishment (not progressing to major), when it comes to their attendance and expected/final grade.

However, five of the significant results yielded curvilinear effects, contrary to the general predictions of SDT. In fact, two of the three significant results for physics, and the only significant result for nutrition, were curvilinear. Thus, although our results offer significant support for our third hypothesis, and the significant linear effects we observed are consistent with SDT, the curvilinear effects suggest that in shifting the focus from global academic motivation to academic motivation for a specific course, some of the assumptions of SDT may not hold. There may even be course differences in the predictive efficacy of the theoretical model. Future replication and extension of this research may be required to determine if SDT may need to be revised in order to be used at the specific course level. Ideally, matched upper-level courses in several disciplines with similar class sizes could be used.

## V. Limitations.

The findings of this study should be interpreted taking into account several project limitations. First, although the study had a large sample size and targeted three different course disciplines, there was an uneven sample distribution across classes. The sample was heavily represented by HAP students due to the larger class sizes and greater number of sections taught. This inequity across courses disciplines reduced statistical power for the physics and nutrition analyses and may partially explain why fewer significant effects were observed for those courses compared to HAP. Future studies should target larger samples of students taking physics and nutrition courses to address this possibility. It is also possible that there is a shift in motivation as students progress in their selected major and future research should explore this possibility by assessing student motivation longitudinally and across different majors which could shed more light on why students in nutrition courses are primarily driven by intrinsic motivation. Second, the sample of students all came from the same university and as such, it is unknown if we can extrapolate these results to other populations of students at different universities. Finally, the five curvilinear effects that were observed are curious and not fully interpretable from a quantitative perspective. A qualitative approach to this type of study to examine additional factors that contribute to these effects may be required.

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