

## Personality and Cognitive Factors Related to Completing Extra Credit Assignments

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We explored the differences in academic achievement, personality, and cognitive factors among students who did and did not do extra credit. A total of 276 undergraduate students enrolled in introductory or upper-level psychology and biology courses were surveyed following their final exams to determine levels of academic self-efficacy, metacognitive ability, and a variety of other demographic factors. We conducted a 2 (Extra Credit: Completed or Not Completed)  $\times$  2 (Course Level: Introductory or Upper-level)  $\times$  4 (Final Course Grade: "A", "B", "C", or "D/F") between-subjects MANOVA with academic self-efficacy and measures of metacognitive ability as dependent variables. Our results indicated that Academic self-efficacy and Regulation of Cognition metacognition scores differed based on these factors. The implications for how course-specific feedback and improved awareness of metacognition can improve student achievement related to our findings and future research directions are discussed.

Despite the well-established research findings that indicate student effort is a clear predictor of academic success, professors routinely observe students that do not take advantage of all of the offered opportunities to improve their grades. One well-documented example of this is the low number of students who complete extra credit work when it is offered. There has been a fair amount of research on faculty and students' perceptions of extra credit in the college setting (e.g., Groves, 2000; Lei, 2013; Norcross, Dooley, & Stevenson, 1993; Norcross, Horrocks, & Stevenson, 1989), but there has been very little examination of why only a few students actually complete extra credit when it is offered. The present study sought to examine whether students who complete extra credit assignments differ in student variables, academic self-efficacy, and metacognitive awareness relative to those who do not complete extra credit.

Students typically report very positive feelings toward their professors offering extra credit (Groves, 2000; Norcross et al., 1989). When asked early in the semester if they plan to complete extra credit assignments, most students report intentions to do so; however, only a small percentage of students actually complete it (Hardy, 2002; Harrison, Meister, & LeFevre, 2011; Moore, 2005). Much of the past research examining extra credit at the college level has focused on determining what types of student variables are related to doing extra credit assignments. The results of such studies indicate that females are more likely to complete extra credit (Harrison et al., 2011), as are those who have higher grades in the class before completing extra credit (Hardy, 2002; Padilla-Walker, Zamboanga, Thompson, & Schmersal, 2005). The exception to this finding is Henley (1994), who found no relationship between completing extra credit and test scores in an Introductory Psychology course. To date, there has not been any past research on class-related variables, such as course level or discipline of the course, and how these relate to extra credit completion.

The literature on student variables and extra credit completion generally suggests that the students who need extra credit the most are ironically the least likely to do it. Consequently, studies have examined factors that may explain why this finding occurs. Silva and Gross (2004) examined whether there was a difference in perception of the value of delayed rewards based on academic achievement by asking students how much extra credit work they would complete across the semester. Even though

lower-achieving students needed more extra credit and said they wanted to earn an "A" in the course, they were less willing than higher-achieving students to complete the extra credit work after they said they would, which Silva and Gross took to indicate these students had less value for a delayed reward. They also offered several plausible alternatives to simply devaluing rewards as a reason for lower-achieving students not completing extra credit, such as low academic self-efficacy, poor history of reward for effort, low interest/motivation in course, and less free time, although these factors were not examined in their study (Silva & Gross, 2004).

As Silva and Gross (2004) noted, another reason why lower-achieving students may not complete extra credit is that they may have less academic self-efficacy (ASE), which is defined as the confidence in one's own ability to learn and do well in academic settings (Zajacova, Lynch, & Espenshade, 2005). Higher ASE is linked to students seeking challenges and more focused effort on learning (Schunk, 1991). Accordingly, students with higher ASE, who also tend to be higher achieving students (Zajacova et al., 2005), may be more likely to complete extra credit because they feel confident in their ability to use their skills and are motivated to do well in their efforts (Bandura, 1993). The only study to date that has examined extra credit completion and ASE predicted that those with higher ASE scores would be more likely to do extra credit as well as choose a higher-stakes, more difficult extra credit assignment (Kurland & Siegel, 2016). They did not find a significant difference in ASE scores among those who did not do any extra credit, those who did an easier assignment, or those who chose the difficult assignment. However, they did note a non-significant trend for students high in ASE to attempt the more difficult extra credit assignment. The authors speculated that it is possible that those higher in ASE may not have felt the need to do extra credit because they may be confident that they can pass the course without extra credit, although this was not directly tested by Kurland and Siegel (2016).

Kruger and Dunning's (1999) study on students' metacognition, which is "the ability to know how well one is performing, when one is likely to be accurate in judgment, and when one is likely to be in error" (p. 1121), may also explain why lower-achieving students are less likely to complete extra credit. They found that students with fewer metacognitive skills were less likely to accurately judge their ability and performance, typically over-

estimating their ability (known as the “Dunning-Kruger effect” or the “above-average effect”). Across four studies, Kruger and Dunning (1999) found that less competent participants not only had poorer performance compared to competent participants, but also the inability to recognize that their performance was poor (indicating lower metacognitive skills).

Not surprisingly, metacognitive abilities are positively linked to academic achievement, such as end of course grades and grade point average (Young & Fry, 2008). For example, Young and Fry (2008) found that two commonly-measured components of metacognition, knowledge of cognition and regulation of cognition, were positively related to class grade and grade point average. Knowledge of cognition is what one is aware of about his or her cognitive processes, while regulation of cognition involves activities such as planning, monitoring, and evaluating one’s learning and the effectiveness of one’s efforts (Schraw & Moshman, 1995). As indicated by Kruger and Dunning’s (1999) studies, those lower in metacognitive skills often overestimate their ability and performance. Interestingly, they also found that the higher-achieving students underestimated their ability and performance (which they called the “false-consensus effect”; Kruger & Dunning, 1999). Thus, it stands to reason that lower-achieving students that do not complete extra credit may do so because of lower metacognitive skills that lead to an overestimation of their ability to perform well in their courses, and therefore do not see the need to put forth the extra effort. On the other hand, higher-achieving students may be more likely to complete extra credit to improve his or her grade because of an underestimation of his or her abilities despite not really needing the extra credit.

## THE PRESENT STUDY

To date, variables such as student characteristics, academic self-efficacy, and measures of metacognitive skills have not been examined simultaneously with regard to extra credit completion. Because these variables are easily measured, can potentially be modified through intervention, and have been shown to be related to one another as well as to academic achievement (Landine & Stewart, 1998), it is important to understand what role they may play in understanding who does and does not complete extra credit when it is available. Furthermore, most past research that examined who does extra credit has focused solely on single courses (that are usually psychology). The present study recruited student participants from several introductory and upper-level psychology and biology courses to attempt to replicate and extend what is already known from past research.

## Hypotheses

Based on the research reviewed herein, we predicted that higher-achieving students, which we based on end-of-semester course grades, would be more likely to report greater academic self-efficacy and more metacognitive skills. Furthermore, we predicted that these personality and cognitive factors are what contribute to past research showing less extra credit completion among low-achieving students and more extra credit completion among high-achieving students. Therefore, we expected that students who score higher in academic self-efficacy and metacognitive abilities would be more likely to complete extra credit assignments. Finally, we will also explore possible interactions among final course grades, extra credit completion, and course

level (introductory vs. upper) with these personality and cognitive variables.

## METHOD

### Participants

A total of 276 undergraduate students (61 males, 214 females, 1 other) enrolled in the authors’ sections of introductory psychology ( $n=91$ ), introductory biology ( $n=75$ ), upper-level psychology ( $n=29$ ), and upper-level biology ( $n=81$ ) courses completed this study between Fall 2015 and Spring 2018 semesters. All participants were over the age of 18 (range= 18-56 years,  $M=24.82$ ,  $SD=8.34$ ) and provided informed consent prior to taking part in the study.

### Materials

#### Academic self-efficacy

Academic self-efficacy (ASE) was measured with the 27-item Academic Self-Efficacy Scale subscale for Confidence adapted by Zajacova, Lynch and Espenshade (2005). Students were asked to rate “how confident you are that you can successfully complete these tasks” on a scale of 0 (not at all confident) to 10 (extremely confident), and their scores were averaged (possible range of 0 to 10), with higher scores indicating more ASE. Example tasks include studying, doing well on exams, taking good class notes, and talking with one’s professor. The Confidence subscale has shown adequate reliability and was based on psychometrically sound instruments (Zajacova et al., 2005). Cronbach’s alpha for the entire sample was 0.87.

#### Metacognitive ability

Metacognitive ability was assessed using the Metacognitive Awareness Inventory (MAI), which consists of 52-items that measure an individual’s Knowledge of Cognition and Regulation of Cognition (Schraw & Dennison, 1994). The first three subscales can be summed together to give an overall score on MAI Knowledge of Cognition (up to 85 points possible), which corresponds to student self-knowledge of their skills and available strategies (Declarative Knowledge), the conditions under which those strategies would best be utilized (Procedural Knowledge), and when and why to use such strategies (Conditional Knowledge). The five remaining subscales (Comprehension Monitoring, Evaluation, Debugging Strategies, Planning, and Information Management Strategies), correspond to regulation of specific skills and can be summed to create a score for MAI Regulation of Cognition (up to 175 points possible) (Schraw & Dennison, 1994). Past research (Schraw & Dennison, 1994) has supported the MAI as a valid and reliable measure of overall metacognitive awareness as well as the two factors, Regulation of Cognition and Knowledge of Cognition. For the present study, Cronbach’s alpha for MAI Knowledge of Cognition was 0.79, while it was 0.87 for MAI Regulation of Cognition.

#### Other measures

In addition to demographic questions, we asked students questions about the course in which they completed the survey, such as whether the course was required, level of interest in course material, expected grade in the course, difficulty to earn expected grade, how they were doing in the course relative to their other courses, and reasons why they did not complete extra credit assignments, if applicable. Students were also asked to rank

order the role of ability, effort, luck, and difficulty as causes for the grade they expected to earn in the course.

## Procedure

All procedures were approved by our institutional review board prior to beginning data collection. We recruited participants by asking our students who were 18 years and over to complete a brief survey after completing their final exam at the end of the semester. After providing informed consent, all students who agreed to participate were given a hard copy of a packet containing the following: demographic and course-related information, the Metacognitive Awareness Inventory (MAI), and the Academic Self-Efficacy (ASE) Scale.

At the end of the survey, we asked whether students had completed extra credit in the course, and if not, to provide reasons for not doing so. After students completed the survey, we gave them a debriefing form that told them that we were tracking who did and did not complete extra credit across the semester and what our hypotheses were. No extra credit was offered for completing this survey to avoid confounding the results.

## RESULTS

### Descriptive Statistics

Basic frequencies were run for most of the demographic and course information questions. The majority of participants reported performing "about the same as my other courses" ( $n=164, 59.4\%$ ) when asked how they were doing in this course relative to other courses being taken at the same time, indicating that their performance in our courses was overall consistent with their other courses. Overall, most participants in our sample did complete at least some extra credit ( $n=220, 79.7\%$ ), with only 56 students ( $20.3\%$ ) not completing any extra credit. Consistent with Harrison et al. (2011), females were more likely to do extra credit ( $80.2\%$ ) compared to males ( $65.8\%$ ),  $\chi^2(2) = 11.87, p=.003$ . Students who had not completed any extra credit were asked to provide reasons for why they did not attempt the offered opportunities. Table 1 shows the reasons students did not complete extra credit as well as the frequency of students associated with each reason.

Reason for not completing extra credit	n	(% students)
Unable to attend events	52	(18.8)
Too many other things going on	47	(17.0)
Did not need to improve grade	9	(3.3)
Did not give self enough time to complete	7	(2.5)
Not motivated to do more than is required	5	(1.8)
Not interested in extra credit topic	2	(0.7)
Extra credit was too challenging	2	(0.7)
Extra credit was not worth time/effort involved	1	(0.4)
Extra credit was not worth enough to help grade	1	(0.4)

Over half of the participants were classified as freshmen ( $n=103, 37.3\%$ ) or sophomores ( $n=70, 25.4\%$ ). The course they completed the survey in was required for  $83.3\%$  ( $n=230$ ) of those surveyed. Forty-eight ( $17.4\%$ ) participants ranked the course they completed the survey in as the highest difficulty level, with most students reporting it was somewhat difficult ( $n=176, 63.8\%$ ).

The factors students believed determines one's course grade were reported as ability ( $n=30, 10.9\%$ ), effort ( $n=200, 72.5\%$ ), difficulty ( $n=35, 12.7\%$ ), and luck ( $n=7, 2.5\%$ ). The interest level of the participants in their courses was reported as extremely interested ( $n=159, 57.6\%$ ), somewhat interested ( $n=111, 40.2\%$ ), or not at all interested ( $n=6, 2.2\%$ ). At the end of the semester, students expected to earn the following grades: "A" ( $n=68, 24.6\%$ ), "B" ( $n=134, 48.63\%$ ), "C" ( $n=66, 23.9\%$ ), "D" ( $n=6, 2.2\%$ ), and "F" ( $n=2, 0.7\%$ ). Actual final grades were "A" ( $n=76, 27.5\%$ ), "B" ( $n=109, 39.5\%$ ), "C" ( $n=68, 24.6\%$ ), and "D" ( $n=20, 7.2\%$ ), and 3 "F" grades ( $1.1\%$ ).

Table 2 shows the Pearson product moment correlation coefficients and the means and standard deviations for the dependent variables (ASE and MAI Knowledge of Cognition and MAI Regulation of Cognition scores). Because all of these variables were significantly correlated with one another, we used multivariate analysis of variance (MANOVA) to test our hypotheses rather than running separate univariate analysis of variance (ANOVA) tests. We ran a one-way MANOVA using the Course the survey was completed in as the independent variable with all of the dependent variables. Because no significant differences were detected based on Course (all  $p$ -values were over .05), we combined the courses into introductory-level (i.e., 1000-2000 level courses) and upper-level (3000-4000 level courses) for hypothesis testing. Further, because the "D" and "F" categories were both small and there were no significant differences found between the two levels of achievement on any of the dependent variables, they were combined into one category for hypothesis testing.

Table 2. Descriptive statistics and Pearson product moment correlation coefficients for Metacognitive Awareness Inventory Knowledge of Cognition (MAI KOC), Metacognitive Awareness Inventory Regulation of Cognition (MAI ROC), and Academic Self-efficacy (ASE).

				Correlation Coefficient	
	M	SD	1	2	
1. MAI KOC	31.62	7.11	0.63*	-0.50*	
2. MAI ROC	70.2	15.93	-0.48*		
3. ASE	7.19	1.12	1.12		

Note: \* indicates  $p < .001$ .

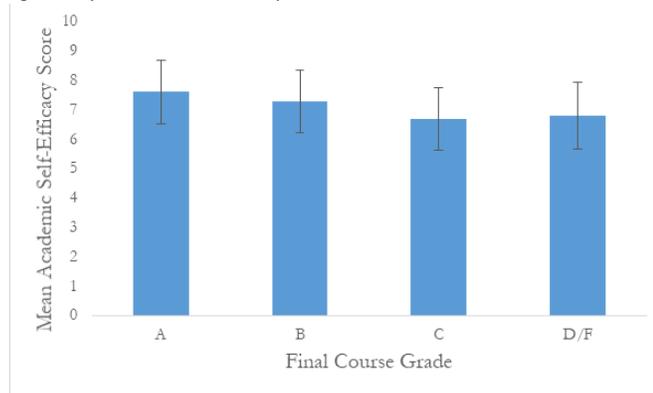
### Hypothesis 1

To test our first hypothesis, which was to determine whether higher-achieving students would be more likely to report higher ASE and MAI subscale scores, we ran a one-way MANOVA with Final Course Grade (grades "A" through "D/F") as the independent variable and ASE and both Regulation of Cognition and Knowledge of Cognition MAI scores as dependent variables.

### Academic self-efficacy (ASE)

The MANOVA revealed a significant effect of Final Course Grade on ASE scores,  $F(3, 272) = 10.07, p < .001$ , with LSD pairwise comparisons demonstrating those with a "C" in the course ( $M = 6.70, SD = 1.06$ ) had significantly lower ASE scores than those with an "A" ( $M = 7.62, SD = 1.06, p < .001$ ) and a "B" ( $M = 7.29, SD = 1.06, p = .002$ ) in the course. Those who earned an "A" had significantly higher ASE scores compared to those who earned a "D/F" ( $M = 6.80, SD = 1.14, p = .008$ ). There were not significant differences between "C" and "D/F" ASE scores ( $p = .98$ ), between "A" and "B" ASE scores ( $p = .18$ ), or between "B" and "D/F" ASE scores ( $p = .19$ ). These results are displayed in Figure 1.

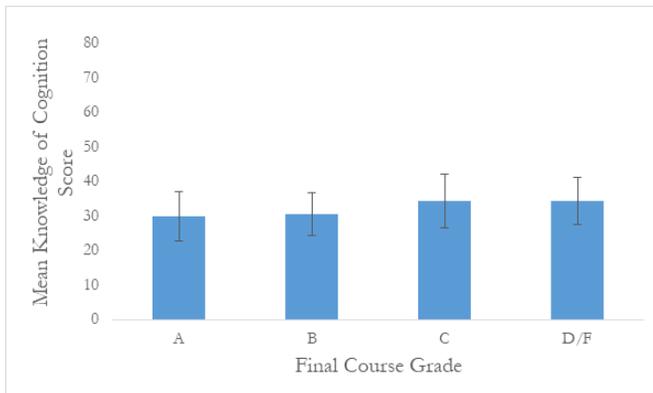
Figure 1. Mean Academic Self-Efficacy (ASE) scores by Final Course Grade with standard deviation error bars. Students earning a “C” or “D/F” grade had significantly lower ASE scores compared to “A” students. Students earning a “C” also had significantly lower ASE scores compared to “B” students.



**Metacognitive ability: Knowledge of cognition**

The MANOVA also indicated a significant effect of Final Course Grade on Knowledge of Cognition MAI scores,  $F(3, 272)=6.72, p < .001$ . As shown in Figure 2, follow-up Least Significant Difference (LSD) pairwise comparison revealed those with an “A” in the course ( $M= 29.88, SD= 7.08$ ) reported significantly lower Knowledge of Cognition MAI scores than those with a “C” in the course ( $M= 34.24, SD= 7.73, p<.001$ ) and a “D/F” in the course ( $M= 34.26, SD= 6.82, p=.008$ ). A similar pattern was seen comparing those with a “B” in the course ( $M= 30.64, SD= 6.20$ ) to those with a “C” ( $p=.002$ ).

Figure 2. Mean Knowledge of Cognition Metacognitive Awareness Inventory (MAI) scores by Final Course Grade with standard deviation error bars. Significantly lower scores were noted in “A” students compared to “C” and “D/F” students and between “B” and “C” students.



**Metacognitive ability: Regulation of cognition**

A significant effect of Final Course Grade on Regulation of Cognition MAI scores was also found,  $F(2, 272)= 3.15, p= .03$ . Follow-up LSD pairwise comparisons showed students earning an “A” ( $M= 67.26, SD= 16.51$ ) had significantly lower Regulation of Cognition compared to those earning a “C” ( $M= 73.94, SD= 15.66$ ). These results can be seen in Figure 3. No other significant differences in Regulation of Cognition MAI scores were found based on Final Course Grade.

**Hypothesis 2**

To test our second prediction, that students who do extra credit will score higher in ASE, MAI Regulation of Cognition, and MAI Knowledge of Cognition, we conducted a 2 (Extra Credit: completed or not completed) x 2 (Course Level: Introductory or

Upper-level) x 4 (Final Course Grade: “A”, “B”, “C”, or “D/F”) between-subjects MANOVA with ASE and the two MAI subscale scores as dependent variables.

**Academic self-efficacy (ASE)**

For ASE scores, there was a significant Final Course Grade by Course Level interaction,  $F(3, 260)= 3.01, p=.03$ . Follow-up LSD pairwise comparisons demonstrated that students who earned an “A” in introductory-level courses ( $M= 8.08, SE= 0.28$ ) reported significantly higher ASE scores than those who earned an “A” in upper-level courses ( $M= 7.23, SE=0.24, p=.02$ ). There was also a non-significant trend in the opposite direction for those who earned a “C” in introductory-level courses ( $M= 6.47, SE= .19$ ) to have lower ASE scores than those who earned a “C” in upper-level courses ( $M= 7.11, SE= .29, p= .06$ ). These results are displayed in Figure 4. A significant Course Level by Extra Credit interaction was also found,  $F(1, 260)= 4.95, p= .03$ , with follow-up LSD pairwise comparisons signifying that students in introductory-level courses who did not do extra credit ( $M= 7.45, SE= .20$ ) had significantly higher ASE scores than those who did do extra credit ( $M= 6.94, SE= .11, p= .02$ ). These results can be seen in Figure 5. Finally, there was a significant main effect for ASE scores for Final Course Grade,  $F(3, 260)= 5.51, p= .001$ ), but since there was a significant higher-order interaction, it is not interpreted here (Cohen, 2004).

**Metacognitive ability: Regulation of cognition**

The MANOVA also indicated a significant Final Course Grade by Extra Credit by Course Level interaction for MAI Regulation of Cognition,  $F(3, 260)= 3.50, p= .02$ . We conducted follow-up LSD pairwise comparisons which, as Figure 6 shows, indicated that introductory-level students that earned an “A” and who completed extra credit ( $M= 68.91, SE= 7.76$ ) scored significantly higher in Regulation of Cognition MA scores compared to those who earned an “A” but did not do extra credit ( $M= 68.91, SE= 2.39$ ) ( $p=.03$ ). There was a non-significant trend ( $p= .07$ ) in the opposite direction for upper-level students that earned an “A” and who completed extra credit to have lower MAI Regulation of Cognition scores compared to those who earned an “A” but did not complete extra credit. Finally, there was a significant difference among upper-level students who earned a “D/F”, such that those who completed extra credit had significantly lower MAI Regulation of Cognition scores ( $M= 114; SE= 15.51$ ) than those who did complete extra credit ( $M= 69.25, SE= 7.76; p=.01$ ).

Figure 3. Mean Regulation of Cognition Metacognitive Awareness Inventory (MAI) scores by Final Course Grade with standard deviation error bars. “A” students had significantly lower scores compared to “C” students.

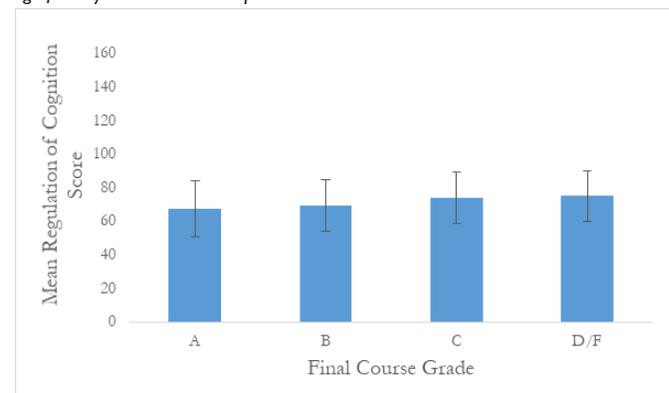


Figure 4. Significant Final Course Grade x Course Level (Introductory vs. Upper) interaction for Academic Self-Efficacy scores with standard error bars. "A" students in introductory-level courses had significantly higher ASE scores than "A" students in upper-level courses. There was a non-significant trend for the opposite effect among "C" students.

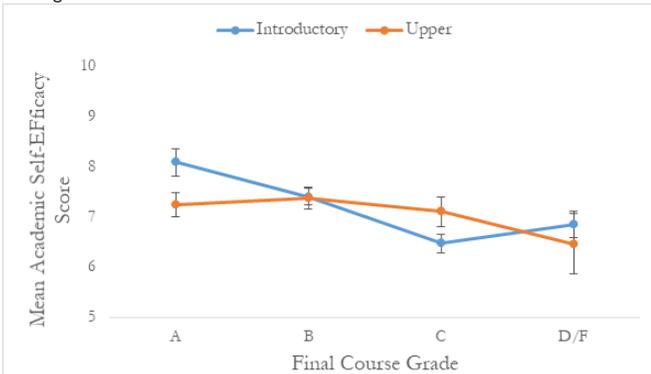


Figure 5. Line graph showing significant Course Level x Extra Credit interaction for Academic Self-Efficacy (ASE) Scale scores with standard error bars. Students in introductory-level courses who did not do extra credit scored significantly higher in ASE than their non-extra credit completing counterparts.



The 2x2x4 MANOVA also revealed significant two-way interactions between Course Level and Extra Credit,  $F(1, 260) = 5.29, p = .02$ , between Final Course Grade and Extra Credit,  $F(3, 260) = 3.74, p = .01$ , and a non-significant trend between Final Course Grade and Course Level,  $F(3, 260) = 2.42, p = .07$ , for Regulation of Cognition scores. Furthermore, there was a significant main effect for Final Course Grade,  $F(3, 260) = 3.82, p = .01$ , and a non-significant trend for a main effect of Course Level,  $F(1, 260) = 3.18, p = .08$ . However, because of the aforementioned significant three-way interaction for Regulation of Cognition MAI scores, we focus our discussion on the highest-order interaction as recommended by Cohen (2004).

**Metacognitive awareness: Knowledge of cognition**

There were no significant main effects or interactions for Knowledge of Cognition MAI scores for hypothesis 2.

**DISCUSSION**

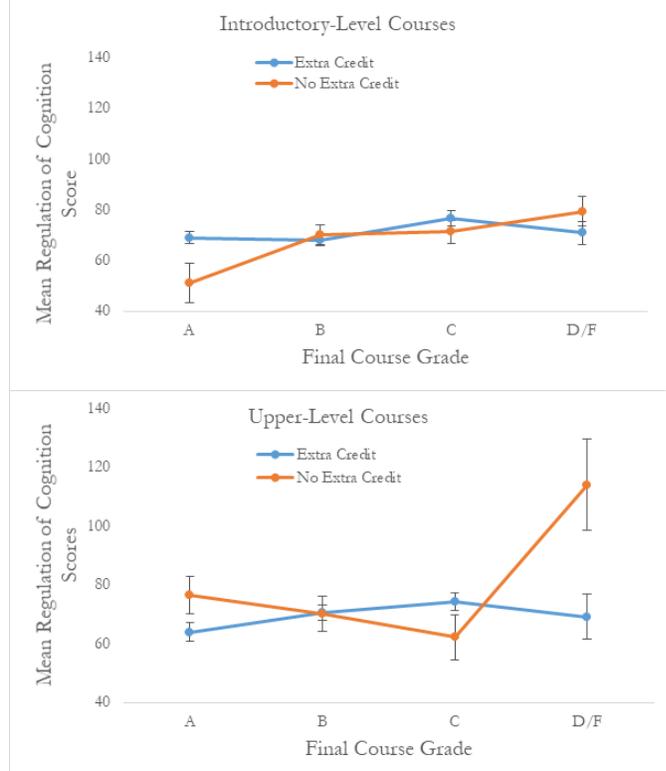
The purpose of this study was to examine the role that student, cognitive, and personality variables play in whether or not students complete extra credit in introductory and upper-level psychology and biology courses. To date, this was the first study to simultaneously examine whether students might differ in completing extra credit based on academic self-efficacy and metacognitive abilities. We selected these variables because they are related to academic achievement (Landine & Stewart, 1998), they are easily measured, and have the potential to be modified

through skill building or feedback on actual performance (e.g., study 4 from Kruger & Dunning, 1999; Schraw, 1998).

Our first hypothesis attempted to replicate past literature by ascertaining that ASE, Knowledge of Cognition, and Regulation of Cognition MAI scores would be higher among higher-achieving students (based on students' final course grade). Our findings for ASE scores were consistent with past research that has demonstrated higher-achieving students are more likely to seek challenges and put forth more effort toward learning (e.g., Schunk, 1991; Zajacova et al., 2005), in that we observed ASE was significantly higher among those who earned an "A" or a "B" in our courses compared to those who earned a "C" or a "D/F". There has only been one study that specifically examined extra credit and ASE, which only found a non-significant trend toward higher-achieving students to attempt a more difficult extra credit assignment (Kurland & Siegel, 2016). Our overall focus in this study was on whether or not students completed extra credit, most of which was quite easy to earn (e.g., attend an event and provide a small write-up or complete online research studies). In line with this, only two students who did not complete extra credit reported they did not do so because the assignments were too difficult.

Our findings for hypothesis 1 related to metacognition and academic achievement were not always in line with past research. For example, MAI Knowledge of Cognition and MAI Regulation of Cognition scores were highest among average ("C") students compared to higher-achieving students ("A" and "B" students). Most past research has shown positive correlations

Figure 6. Significant Final Course Grade x Extra Credit x Course Level three-way interaction for mean Regulation of Cognition Metacognitive Awareness Inventory (MAI) scores with standard error bars. Introductory-level students who earned an "A" and completed extra credit had significantly higher MAI scores compared to their non-extra credit completing counterparts. Upper-level students who earned a "D/F" and did not complete extra credit had significantly lower MAI scores compared to those who did extra credit.



between measures of metacognition and measures of academic achievement, such as exam performance (Schraw & Dennison, 1994) and GPA (Young & Fry, 2008). In the present study, we used end-of-semester course grades as our measure of academic achievement, which is a broader measure than performance on a single exam, but not as broad as overall GPA, and this may have accounted for the different results compared to past studies using different gauges of academic achievement. Alternatively, it may be that lesser-achieving students (“C” grade and below) overestimate their Knowledge and Regulation of Cognition skills (i.e., the “above-average effect”), whereas the higher-achieving students underestimate these skills (i.e., the “false-consensus effect”), as shown by Kruger and Dunning (1999). At this time, it is unclear why students’ academic self-efficacy was high among higher-achieving students, yet their metacognitive skill scores were lower than lower-achieving students. Future research in this area should examine additional variables, such as reasons for completing extra credit (as opposed to only reasons for not completing it as we did in this study) as well as measures of academic motivation and academic locus of control, since these variables are correlated with metacognition, academic self-efficacy, and academic achievement (Landine & Stewart, 1998).

Our second hypothesis, which was that those who completed extra credit would report higher ASE and metacognitive regulation and knowledge scores compared to students who did not do extra credit, was partially supported. While there were not any significant main effects for extra credit completion on our dependent variables, there were several significant interactions found for ASE and Regulation of Cognition MAI scores (although no effects for Knowledge of Cognition MAI scores). With regard to ASE, we found that students in introductory-level courses who did not do extra credit reported higher ASE scores than those who did do extra credit. This finding is in line with the notion that students with higher ASE would be more confident in their ability to pass a course (Schunk, 1991; Zajacova et al., 2005) and thus may not feel the need to complete extra credit assignments. Interestingly, the two-way interaction between course level and final course grades showed that those who earned an “A” in introductory-level courses had significantly higher ASE compared to those who earned an “A” in upper-level courses. This effect may be due to the fact that most of the introductory-level students were first or second-semester freshmen who had not yet received a lot of performance feedback in their college courses; therefore, they may have overestimated their ability to reach their academic goals compared to students who had received more feedback in previous semesters. An extensive body of research has shown that ASE is positively associated with grades in college (e.g., Schunk, 1991), which is consistent with our findings; however, to our knowledge, this is the first study to note differences in ASE among high-achieving students in introductory and upper-level courses. Because introductory students are typically used as research participants, this finding indicates that future research is needed to determine whether and how ASE changes as one progresses through college.

As for metacognition in hypothesis 2, the significant three-way interaction we found indicated that “A” students in introductory-level classes who did extra credit actually reported significantly higher Regulation of Cognition MAI scores compared to introductory-level “A” students who did not do extra credit. This may be because some high-achieving students underesti-

mate their ability and thus do extra credit to make up for what they feel they are missing (i.e., the “false-consensus” effect; Kruger & Dunning, 1999). Also, introductory-level students have less performance feedback, so they may have taken advantage of extra credit opportunities because they wanted to ensure their academic success. Future research is needed to not only understand how changes in metacognitive abilities unfold over students’ academic careers, but also how increased feedback can improve metacognitive regulation. Such research may also help to reveal why no effects were found for Knowledge of Cognition scores in this sample.

## CONCLUSIONS

Overall, our exploratory study showed that only ASE and Regulation of Cognition MAI scores were related to extra credit completion, and although these relationships were not always in the direction we predicted, we did find that they were in line with some of the past literature in related areas of research as previously described. The lack of significant differences among Knowledge of Cognition MAI scores may be due to some of the limitations of this study. Perhaps the biggest limitation is that we had a fairly low response rate from students who did not do any extra credit (approximately 20% of our sample did not complete any extra credit) and we had a low response rate among those who earned a “D” or “F” in our courses. The fact that it was difficult to recruit lower-achieving students and those who do not do extra credit in the present study has several implications for giving students extra credit for participating in research that should be considered (see Padilla-Walker et al., 2005).

Our study also had several strengths. It was the first of its kind to examine differences in course level, personality variables, and metacognitive skills among those who do and do not complete extra credit assignments. We surveyed students in our courses and linked their data with their actual final course grades rather than only an estimate or self-report. We also included students from introductory and upper-level courses from two disciplines, psychology and biology, to expand our findings beyond a single course or discipline. Finally, while not a focus of the present study, we found that most students do not report extra credit completion when asked to list strategies for ways to meet their final course grade goal.

As previously mentioned, we chose to examine metacognitive ability and academic self-efficacy because these variables are related to academic achievement, are easily measured, and are potentially modifiable (unlike measures of intelligence, which are assumed to be stable; Dollinger, Matyja, & Huber, 2008; Schraw, 1998). As such, there are many ways our initial findings could be used to improve teaching and learning in the college setting. For example, students could be screened at the beginning of the semester by professors or academic success centers to target those at risk for low academic achievement. Also, faculty and those involved in student success programs could model metacognitive knowledge and regulation in class or workshops and provide students with course-specific feedback early in the semester to develop student self-efficacy. Finally, faculty professional development opportunities could discuss how extra credit opportunities can serve as a low-stakes means for students to gain additional confidence with course-related material. Future research should examine how training in metacognitive skills might relate to increased rates of extra credit completion in

courses in which it is offered. Also, a future study could examine how course-specific feedback affects extra credit completion across the semester (e.g., completing extra credit before midterm versus after midterm or based on straightforwardness of material across the semester) and whether metacognitive ability and/or academic self-efficacy affect the timing of extra credit completion. By studying the relationship between completing extra credit and personality and cognitive variables such as these, we hope that making recommendations to take advantage of extra credit opportunities will be part of a comprehensive student success program.

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