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College students' homework and academic achievement: The mediating role of self-regulatory beliefs

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Abstract The influence of homework experiences on students' academic grades was studied with 223 college students. Students' self-efficacy for learning and perceived responsibility beliefs were included as mediating variables in this research. The students' homework influenced their achievement indirectly via these two self-regulatory beliefs as well as directly. Self-efficacy for learning, although moderately correlated with perceptions of responsibility, predicted course grades more strongly than the latter variable. No gender differences were found for any of the variables, a finding that extends prior research based on high school girls. Educational implications about the importance of students' homework completion and its relationship to college students' development of self-regulation and positive self-efficacy beliefs is discussed from a social cognitive perspective.

Keywords Self-regulated learning · College students · Homework · Self-efficacy

More than a decade ago, Pressley and McCormick (1995) surveyed the literature and asked, "Does homework encourage the development of better study habits or greater self-regulation? We do not know at this time" (p. 341). Although there is extensive evidence that homework can lead to higher levels of subject matter learning (Cooper and Valentine 2001; Trautwein et al. 2002; Trautwein and Köller 2003), there has been little research indicating that homework experiences can also enhance students' development as self-regulated learners with a greater sense of responsibility toward learning.

In a relatively recent study of this issue, Zimmerman and Kitsantas (2005) examined high school girls' homework and academic achievement along with two key intervening variables: self-efficacy for learning and perceived responsibility. Self-efficacy refers to beliefs about one's capability to learn or perform a task effectively. An important type of self-efficacy focuses on students' beliefs about their capability to self-regulate various

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forms of academic learning, such as studying and test preparation. The second intervening variable, perceived responsibility, refers to students' causal attributions regarding their learning processes and outcomes. Ninth through 12th grade girls attending a highly selective parochial school, which emphasized the importance of homework in the curriculum, participated in the study. Path analyses revealed that the girls' homework practices directly predicted their self-efficacy for learning beliefs and perceived responsibility beliefs but, not their Grade Point Average (GPA) at the end of the school term. In fact, the results revealed that the path from the girls' homework practices to their GPA was mediated through their self-efficacy and perceived responsibility beliefs.

The purpose of the present study is to test the generality of these findings further using a college sample consisting of both male and female students. Although the development of students' self-regulatory processes (e.g., goal setting, self-monitoring, strategy use, self-evaluation, and attributions) has been a major focus of research on self-regulation of learning (see chapters in edited books by Boekaerts et al. 2000; Pintrich 1995; Schunk and Zimmerman 1994, 1998; Zimmerman and Schunk 2001), the impact of homework experiences on college students' acquisition of self-regulated learning skill has received very little study to date. In fact, most of the research on homework has focused on its positive impact on achievement (Trautwein and Köller 2003; Keith et al. 2004).

Self-regulation refers to the degree to which students are active and responsible participants in their own learning process (Zimmerman 1994). Research has established that self-regulatory processes, such as goal setting, self-monitoring, and self-evaluating, are highly predictive of students' achievement track in school, as well as their scores on standardized tests of achievement (Zimmerman and Schunk 2001). The present study focuses on two major constructs of self-regulation: self-efficacy beliefs for academic learning and perceived responsibility. Recent evidence suggests that these two forms of self-regulatory beliefs were each highly predictive of student achievement (Zimmerman and Kitsantas 2005).

Furthermore, students' self-efficacy beliefs about their learning processes, as well as their self-regulated use of these processes have been hypothesized to affect their perceptions of personal responsibility for learning (Zimmerman 1994, 2006). There is evidence that students who self-regulate their goals and self-monitor their goal attainment are more likely to attribute the outcomes to personally controllable strategies than students who fail to self-regulate their goals and self-monitor (Zimmerman and Kitsantas 1999). To our knowledge, the issue of students' causal attributions of learning to a teacher's influence has not received much study to date. Historically, attribution theorists have focused on other personally uncontrollable variables, such as luck. Attributing academic outcomes to one's teacher could be another way of displacing personal responsibility. Another measure of student responsibility, entitled the Intellectual Achievement Responsibility (IAR) scale, was developed by Crandall et al. (1965) a number of years ago. Unfortunately, the scale had a relatively low level of reliability, and its correlations with achievement tests were relatively low, and the scale has received little use in recent years. This scale did not deal with the role of teachers in students' perceptions of academic responsibility.

The attribution of responsibility for personal academic outcomes to teachers is a complex issue because highly self-regulated students seek help from teachers and classmates more frequently than poorly self-regulated students (Zimmerman and Martinez-Pons 1986). Highly self-regulated students are also distinguished by the adaptive quality of their help seeking (Newman 1994; Karabenick and Knapp 1991). Although attributions were not studied in prior research on goal setting and help seeking, there is other research that links causal attributions to goal setting. For example, students who set learning strategy goals for

writing attributed their outcomes to personally controllable strategies significantly more often than students who did not set strategy goals (Zimmerman and Kitsantas 1999). Because self-regulated students seek help from instructors to achieve independent mastery, they were hypothesized to attribute more causation of academic learning to themselves than to their instructors.

Along with the student self-efficacy beliefs and perceived responsibility variables, the present study focuses on the role of homework *quality* and *quantity* on student achievement and motivation. Trautwein et al. (2006) found that homework quality of 8th graders had a positive effect on their homework motivation and effort at both a class-level and a student level of a hierarchical statistical analysis. Homework quantity also has an effect on student achievement. Trautwein et al. (2002) investigated the link between mathematics achievement and homework frequency with 7th graders. After controlling for intelligence, SES, motivation, and type of secondary school, these researchers found that students' frequency of homework had a positive effect on their math achievement. Similar findings were reported by Keith et al. (2004) based on longitudinal data from the National Educational Longitudinal Study (NELS). In this study of 12th graders, Keith et al. compared the effect of the time spent on in-school homework (defined as "home" work completed while in school) and time spent on out-of-school homework on high school students' grades. Results indicated that students' out-of-school homework time had a strong influence on their GPA, whereas in-school homework had no effect on their GPA. This same advantage of out-of-school homework time on GPA held true for 10th graders as well. In this particular study, the researchers did not focus on gender differences in homework completion.

A number of researchers (Cool and Keith 1991; Trautwein et al. 2002) have emphasized the need to include measures of students' prior achievement when studying the impact of homework on academic outcomes. Students' performance on standardized tests has been widely viewed as a strong predictor of their success in school. Homework can be expected to influence students' achievement because high achieving high school students spend more time on their assignments than low achieving students (Campbell et al. 2000). Finally, we anticipated that high achieving students would develop stronger self-efficacy beliefs about their capability to learn on their own (Zimmerman et al. 1992) and would perceive themselves as more responsible for their academic success (Zimmerman and Kitsantas 2005).

In research with elementary school age children, Warton (1997), found no gender differences in the homework routines of second-, fourth- and sixth-graders. However, gender differences in homework routines have been reported in other research. For example, in a study of high school students, Xu (2006) discovered that female students managed their homework environment and time more effectively than male students. Moreover, girls also monitored and controlled their emotions more effectively than boys. Thus, gender differences in students' homework routines have emerged in at least one study with high school students.

The present research was designed to extend an earlier investigation with high school girls (Zimmerman and Kitsantas 2005) to include college students of both genders. We hypothesize that the quality and quantity of college students' homework would predict their academic grade in an educational psychology class. The effect of homework experiences on students' grades was expected to be mediated by two key self-regulatory beliefs: self-efficacy and perceived responsibility beliefs. Because homework is completed outside of class, students who complete their homework successfully are expected to grow in their sense of efficacy about learning on their own. The location of the students' self-efficacy

beliefs between the students' homework experiences and their course grades in the path model is based on Bandura's (1986) triadic theory of reciprocal determinism. This formulation posits that prior environmental experiences (e.g., homework practices) can influence one's personal beliefs (e.g., self-efficacy), which in turn can influence students' behavioral outcomes (e.g., course grades).

Homework activities are also expected to enhance students' perceived responsibility for academic outcomes, and this belief in turn is expected to predict students' academic achievement. Regarding the relation of self-efficacy and perceived responsibility beliefs, social cognitive researchers (e.g., Zimmerman 1994) have hypothesized that self-efficacy beliefs are predictive of perceived responsibility because learners who believe they can self-regulate their learning processes are more likely to acknowledge responsibility for academic outcomes. It is also possible that, over time, doing homework can influence students' perceptions of responsibility directly, and this hypothesis will also be tested in the proposed path model as well. Finally, the students' entrance scores on the SAT will be included to assess the effects of prior achievement (see Fig. 1).

Method

Participants

A total of 223 college students from a major state university participated in the study. These students were enrolled in six sections of an introductory educational psychology course and were invited to participate in the study. Of the 264 students enrolled in these sections, 232 chose to participate (88%). Nine students were graduate students taking the course to fulfill teacher certificate requirements and were dropped from the study leaving a sample of 223 undergraduate students. The instructors offered the students extra course credit as an incentive for completing the surveys.

Measures

Personal data questionnaire This brief questionnaire was developed to obtain information regarding the participants' age, year in school, and ethnicity. The ethnic composition of the students was as follows: 81.2% White, 10.3% Black, 3.6% Hispanic and 4.9% Asian/others. Twenty-five percent of the students were male and 75% female. They ranged in age from

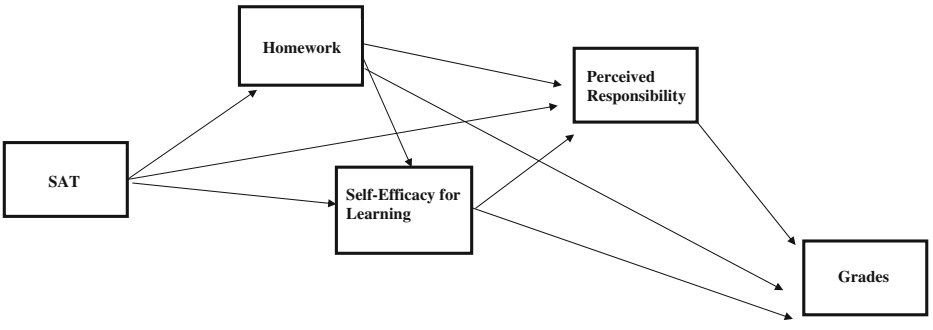

Fig. 1 Hypothesized path model for SAT, students' homework reports, self-efficacy for learning, perceived responsibility, and course grades

18 to 49 years with a mean age of 21.92 years. This questionnaire also queried the students to indicate approximately how many hours of homework were assigned daily by their instructors in all of their courses. Students reported that on the average approximately 4 hours and 25 minutes of homework in length were given daily.

The students' combined verbal and math SAT scores were 567 and their grades in their educational psychology course were obtained from school records. No effort was made to assess students' history of homework support from parents, teachers, and peers in this research, with college students. These variables have been found to be important in studies with younger populations of students (Hoover-Dempsey et al. 1995; Corno and Xu 2004).

Homework survey This survey was composed of two separate multi-item scales of students' homework practices: one referring to quantity and the other referring to quality. The *quantity of homework* scale was composed of two items dealing with amount of time spent in homework activities. The first item was: "How much time do you spend on homework every day?" and a second item was, "How much time do you spend studying for a chapter test?" Items in this scale were answered in open-ended formats in terms of hours. The Cronbach alpha reliability of this scale was 0.72. The first item is similar to the most widely used measure of students' quantity of homework in prior research (Trautwein et al. 2002), and has generally been positively related to achievement outcomes among high school students (Cooper and Valentine 2001).

The *quality of homework* scale includes five items dealing with advantageous homework practices. The questions related to quality of homework include: "Do you have a regular time to study?"; "Do you have a regular place to study?"; "Do you estimate the time needed to complete your assignments before you begin studying?"; "How often do you set task priorities when you do homework?"; and "How often do you complete your daily assignments?" These items were rated on a Likert rating scale ranging across: 1 (never), 2 (seldom), 3 (often), 4 (usually), and 5 (always). The Cronbach alpha reliability coefficient for the scale was 0.82. It should be noted that no distinction is drawn between "homework" and "studying" in these scales, and these two terms were used interchangeably. Homework was defined for the students as any schoolwork that is done outside of class (*Webster's New 20th Century Dictionary of the English Language* 1980), regardless of whether it was specifically assigned by the teacher or personally undertaken by the student. These rating scales were less specific than diary or log measures of daily homework completion, but were shown to correlate quite highly with students' outcomes.

Self-efficacy for learning form (SELF) This instrument assesses students' use of various self-regulation processes in academic content areas, note taking, test taking, as well as general studying. The SELF was designed to measure each participant's perceived self-efficacy to perform various forms of academic learning, such as reading, note taking, test taking, writing, and studying (See Appendix). The items sought to extend beyond students' self-beliefs about their procedural knowledge and skill (e.g. about using learning strategies) to include their conditional self-efficacy beliefs (e.g., about coping with specific learning contexts). An example of a question is: "When you are feeling depressed about a forthcoming test, can you find a way to motivate yourself to do well?"

The students responded using a scale that ranged from 0 to 100 points in 10-unit increments. Written descriptions were provided beside the following points on the scale: 0 (definitely cannot do it), 30 (probably cannot do it), 50 (maybe), 70 (probably can do it), and 100 (definitely can do it). Higher scores on this scale reflect more positive self-efficacy

for learning beliefs. Bandura (2005) has recommended the use of decile-based self-efficacy scales when feasible rather than scales involving fewer data points because the former are more sensitive and reliable, and there is evidence to support this assumption (Pajares et al. 2001). Prior research revealed that a 57-item scale involved a single self-regulatory factor, and was highly reliable (Zimmerman and Kitsantas 2005). These findings indicated that the development of a shorter scale might suffice. In recent research using the same participants and data base as the present study, we studied the effectiveness of an abridged SELF scale involving 19 items (Zimmerman and Kitsantas 2007). The Cronbach alpha reliability coefficient for that abridged scale was 0.91 and its predictive validity of teacher rating of students' self-regulation in classroom settings was $r=0.52$. The effect size was large ($d=1.2$).

Perceived responsibility for learning scale This 18-item scale was designed to indicate whether the respondents perceived the student or the teacher as more responsible for various learning tasks or outcomes, such as a student's motivation (e.g., going through the motions without trying), deportment (e.g., fooling around in class), and learning processes (e.g., not taking notes in class). The directions informed the respondents that students' academic outcomes may be partly due to their teachers' efforts and partly due to the student's efforts. The students were then asked to judge who is more responsible, the teacher or the student. For example, item 11 asked, "Who is more responsible for a student being interested in school," and item 12 asked, "Who is more responsible for a student not remembering information from assigned readings?" The respondents answered using the following seven-point scale: 1 (mainly the teacher), 2 (definitely more the teacher), 3 (slightly more the teacher), 4 (both equally), 5 (slightly more the student), 6 (definitely more the student), and 7 (mainly the student)?" Thus, higher scores on this scale represent the degree of responsibility that is attributed to the *student* for the learning outcome in question. A common latent factor was expected due to the fact that all items in the scale related to students' perceptions of responsibility for academic learning, motivation, and behavior. Prior research revealed a single factor structure for this scale and a Cronbach alpha reliability coefficient of 0.90 was obtained (Zimmerman and Kitsantas 2005). The scale was highly predictive of students' high school grades, $r=0.86$, $d<2.0$, which is a large effect size.

Procedure

The scales were administered during a regular class at the beginning of the fall semester. The students were told to take class time completing the surveys, and if they had any questions, they should ask the experimenter. The students were also asked to respond to questions in relation to their Educational Psychology course. Finally, the students' grades were obtained from school records at the end of the semester.

Research design for a predictive model for homework

Path analysis procedures were selected to determine whether students' self-efficacy for learning and perceived responsibility beliefs served as mediators between their reports of homework completion and their academic grades. Although causality cannot be inferred definitively from correlational data, the role of intervening variables can be studied from path diagrams. The hypothesized path model was based on a model that was validated in prior research with high school girls (Zimmerman and Kitsantas 2005). The proposed model is presented earlier in Fig. 1.

Results

As a preliminary step in analyzing the obtained data, tests of kurtosis and skewness were conducted to verify the normality of the six measures. With one exception, all indices of kurtosis and skewness fell between + and − 1.00, which is considered excellent. The index of kurtosis for the perceived responsibility scale was −1.60, which is considered acceptable (George and Mallery 2003). These outcomes indicate that the use of parametric statistical procedures to analyze the data was appropriate.

Gender analyses

Differences between male and female students on all dependent measures were compared using analysis of variance procedures (see Table 1). No significant differences emerged for any of the variables between groups, and their data were combined for subsequent analyses. In addition, further analyses on the demographic variables (age and ethnicity) for each gender indicated that females and males were similar on those variables. Specifically, the mean age for males was 22.20 (SD=3.97) and for females 21.47 (SD=3.70). For the variable of ethnicity, 79.6% of the males were White, 13% Black, 3.7% Hispanic, and 3.7% Asian/other; whereas 81.5% of the females were White, 10.1% Black, 3.6% Hispanic and 4.8% Asian/Other.

Correlation analyses

The zero-order correlations among the six measures along with the means and standard deviations for these measures are presented in Table 2. It will be noted that all variables significantly predicted the students' grades at the end of the academic semester. Furthermore, grades correlated (r=0.33) with the SAT measure indicating that teacher-assigned grades were significantly associated with a standardized measure of achievement before entering college.

Table 1 Means and standard deviations for dependent variables and by gender

	M	SD	*F*	*p*
Perceived Responsibility	5.37	0.95	1.54	0.22
Male	5.23	1.02		
Female	5.42	0.92		
Self-Efficacy for Learning	76.07	11.22	0.04	0.95
Male	75.99	12.61		
Female	76.10	10.77		
Quality of Homework	3.50	0.99	1.29	0.26
Male	3.64	1.00		
Female	3.46	0.99		
Quantity of Homework	3.73	0.95	1.15	0.22
Male	3.82	1.09		
Female	3.71	0.91		
Course Grade	83.93	8.85	0.12	0.73
Male	83.57	10.09		
Female	84.05	8.45		

Table 2 Zero-order correlations among the variables

Variables	1	2	3	4	5	6
1. Course Grade	1.00					
2. Quality of Homework	0.60**	1.00				
3. Quantity of Homework	0.62**	0.58**	1.00			
4. SELF	0.58**	0.55**	0.58**	1.00		
5. Perceived Responsibility	0.40**	0.38**	0.40**	0.50**	1.00	
6. SAT	0.33**	0.35**	0.30**	0.32**	0.36**	1.00

**Correlation is significant at the 0.01 level (two-tailed)

Path analyses

A path analysis was conducted to test the hypothesized mediating relations among the five observed variables using the LISREL program (Joreskog and Sorbom 1996). We initially combined the quality and quantity of homework scores, but the proposed model would not run due to a high level multicollinearity between the combined measure of homework and other measures in the model. We also sought to run homework as a latent variable, but that model also failed to run because of multicollinearity. As a result, we decided to use only one measure of homework in the path analysis. The quality measure was selected so that the results of the present study could be compared with the path model results in prior research with high school girls (Zimmerman and Kitsantas 2005). In that earlier study, as well as in the present study, the quality of homework scale was more reliable than the quantity of homework scale (alphas: 0.82>0.72 respectively). Thus, the quality of homework measure was selected for inclusion in the path model for empirical, as well as conceptual reasons.

The revised model provided a good fit for the obtained results, with a chi-square χ^2 (1) = 1.34, p<0.25, (NFI=0.99, CFI=1.00, and RFI=0.96). The results from the path analysis of the proposed model are presented in Fig. 2. The exogenous SAT measure of prior achievement predicted the quality of the students' homework practices, self-efficacy for learning, and perceived responsibility significantly. As hypothesized, the paths from the quality of homework to self-efficacy for learning, from self-efficacy to perceived responsibility, and from quality of homework to grades in educational psychology were statistically significant and quite substantial in size. The paths between homework and

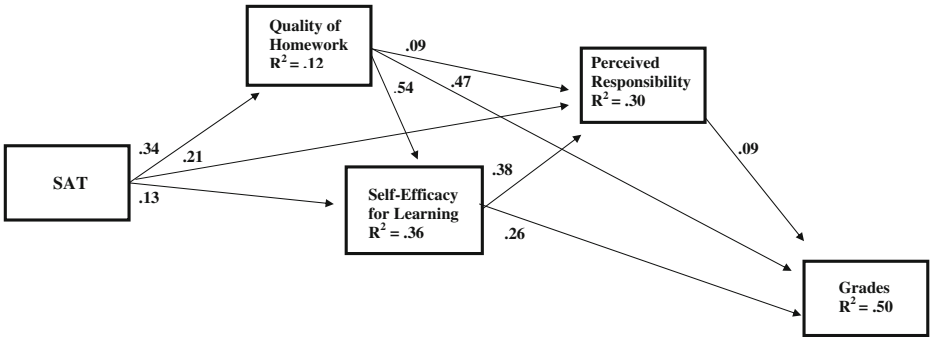

Fig. 2 Path coefficients for SAT, students' homework reports, self-efficacy for learning, perceived responsibility, and course grades. All path coefficients are statistically significant, p<.05

perceived responsibility and between self-efficacy and grade in educational psychology were also significant, but were much smaller in size.

The decomposition of the direct and indirect effects of the variables is listed in Table 3. There was no direct effect of the students' prior SAT achievement on their educational psychology grade, but there was an indirect effect (p=0.28). This indicates that most of the variance in prior achievement was mediated through homework related variables in the model. The direct effect of homework quality on students' course grades was large (p= 0.47), but direct influence of students' self-efficacy for learning on their course grades would be classified as medium (P=0.26), according to Cohen's (1988) criteria.

Because the direction of prediction between self-efficacy and perceived responsibility beliefs in the proposed model may be questioned, a second path model was analyzed. In this model, the direction of the relationship between these two variables was reversed, with perceived responsibility predicting self-efficacy. This model provided a nearly identical fit for the data, chi-square χ^2 (1) = 1.34, p=0.25, NFI=1.00, CFI=0.99, and RFI=0.96, indicating that the prediction may flow in either direction between these two mediational self-beliefs. In addition, given that the homework quality and two self-beliefs were assessed at the same point in time, it is possible that homework quality could have been an outcome of self-efficacy beliefs instead of a cause. This reverse hypothesis was tested in a third alternative path model: The two self-beliefs were positioned as causal variables, and homework served as the intervening variable when predicting the students' academic grades. This reverse model did not provide a good fit for the data, chi-square χ^2 (2) = 43.05, p<0.001, NFI=0.87, CFI=0.87, RFI=0.34, indicating that homework experiences influenced the students' self-beliefs rather than the reverse.

Discussion

In response to Pressley and McCormick's question, we found that the quality of students' homework is significantly related to their development of better study habits. Overall, the results revealed significant mediational roles for self-efficacy for learning and perceived

Table 3 Decomposition of total (T), direct (D), and indirect (I) effects of variables from the path analysis

	Predicted Variables			
Predictor Variable	2	3	4	5
1. SAT	*T*=.34	*T*=.32	*T*=.36	*T*=.28
	D=.34	*D*=.14	*D*=.21	*D*=.00
	I=.00	*I*=.18	*I*=.15	*I*=.28
2. Quality of Homework		*T*=.54	*T*=.29	*T*=.64
		D=. 54	*D*=.09	*D*=.47
		I=.00	*I*=.20	*I*=.17
3. Self-Efficacy for Learning			*T*=.38	*T*=.30
			D=.00	*D*=.27
			I=.00	*I*=.03
4. Perceived Responsibility				*T*=.09
				D=.09
				I=.00
5. Course Grade				

responsibility beliefs in explaining the impact of homework experiences on the course grades of college students. More specifically, the quality of the college students' homework had a significant direct impact on their grades and a significant indirect effect primarily via their self-efficacy beliefs. These findings with higher education students provide a good fit for the path model based on prior research with high school girls (Zimmerman and Kitsantas 2005). Two alternative models were also tested to compare the path model depicted in Fig. 1. The first model tested the alternative hypothesis that homework could influence self-efficacy for learning and perceived responsibility beliefs, rather than the reverse, but this analysis revealed a poorly fitting model. The second path model tested the alternative hypothesis that perceived responsibility could precede self-efficacy for learning, rather than the reverse, and this analysis revealed a comparable fit to the hypothesized model. Collectively, these results indicate support for the model depicted in Fig. 1, which extend prior path analysis results from high school girls to college students of both genders. These results also provide support for prior research in the field documenting the positive effects of quality of homework on student motivation (Trautwein et al. 2006) and achievement (Cooper and Valentine 2001).

However, when considered over longer periods of time, the issue of causality between homework and self-regulatory beliefs becomes more complex. Even if homework assignments initially lead students to feel more self-efficacious about their self-regulatory methods, overtime these self-beliefs could lead to higher quality homework if the relation between these measures is reciprocal. This would be a particularly desirable outcome from a social cognitive perspective.

The same statistical model fit the present data as well as those in Zimmerman's and Kitsantas (2005) study, but the role of perceived responsibility beliefs was weaker in the path model with the collegiate sample. By contrast, the self-efficacy for learning measure was a better predictor of college students' academic outcomes than perceived responsibility (r=0.58 versus r=0.40). This reverses the relative roles of self efficacy and perceived responsibility found in the study of high school girls (r=0.68 versus r=0.86). There are several possible reasons for the small effect of perceived responsibility on college students' grades (0.09) in the present study.

First, the perceived responsibility scale involved comparisons of teachers' versus students' role in various academic outcomes. The participants in the present study were college students, the majority of whom were in their junior year. These students are more likely to assume the personal responsibility for learning than high school students because of the role of the instructor at the collegiate level in homework tends to be less direct. College students presumably will have less credibility in blaming their teacher for unfortunate academic results. In general, school systems require that students assume more academic responsibility for learning as they move from elementary school to college (Zimmerman 2002). The mean level score on the perceived responsibility measure in the present study was 5.35, whereas it was 5.21 in our earlier study with high school students. Although these means are relatively high on a 7 point scale, it does not appear that a ceiling effect can explain the lower correlation with students' academic outcomes. Second, in the high school setting that was studied in prior research (Zimmerman and Kitsantas 2005), the girls regularly turned their homework in to their teachers as part of their assigned academic work, whereas at the collegiate level, students' homework completion was seldom monitored directly by their teachers.

In regard to gender, no differences were found in any of the variables included in the path model. Female students in collegiate academic settings approached homework experiences similarly to male students and reported the same levels of perceived responsibility and self-efficacy beliefs. To our knowledge, no research studies have

reported gender differences in homework experiences with college students, but a recent study with high school students has detected gender differences with female students managing their homework environment more effectively than male students (Xu 2006). Since the dependent measures in that prior research differed from those in the present study, it is unclear why gender effects emerged in that one particular study.

In terms of background variables, students' SAT scores had an indirect effect of 0.28 on their course grades, but no direct effect. Thus, a widely used measure of mental ability influenced collegiate course grades via an improved studying and superior self-regulatory beliefs. More specifically, the quality of homework assignments had a direct effect of 0.47 on course grades, and self-efficacy for learning beliefs had a total effect of 0.30 on course grades, with 0.27 being a direct effect. Perceived responsibility had a direct effect of 0.09 on students' grades and no indirect effect. The size of the direct effect of students' self-efficacy for learning beliefs on their course grades was larger than the small effect size reported for self-belief measures in general according to a meta-analysis (Valentine et al. 2004). However, the effect sizes assessed in the meta-analysis were larger when the measure of self-beliefs pertained to a specific academic domain and were matched to achievement measures. Both of these advantageous conditions were operative in the present study with regard to the Self-Efficacy for Learning measure.

Limitations of the present study include the fact that no data were collected on the nature of instructional support that students were provided to complete their homework successfully. Although, all the same syllabi were used across the different course sections and the assignments were the same, in future research it would be important to understand how homework instructional support can lead to enhancements in self-regulated learning and student motivational beliefs. Furthermore, experimental studies should be conducted to determine what other variables in addition to homework practices (e.g., teacher support, features of homework) impact student motivation and self-regulation, and in turn, learning and performance.

In conclusion, the findings of the present study indicate that there are important psychological benefits of homework on college students' development, as independent learners with better study skills and greater self-efficacy beliefs and responsibility toward learning. However, drawing causal inferences regarding these variables is difficult. First, path analysis is a descriptive procedure, not an experimental test of causality. Second, the underling relation between homework and self-regulated learning is likely to be reciprocal over time with homework eventually becoming an effect of higher forms of self-regulation, as well as a cause. Third, homework, self-efficacy, and perceived responsibility scales were self-report measures. Because of these concerns about the social desirability and accuracy of recall, it would be desirable in future research to collect behavior measures of homework completion, as well as student reports (Winne and Jamieson-Noel 2002; Winne and Perry 2000; Zimmerman 2008).

These findings have important educational implications for educators. Homework assignments not only have a significant impact on students' achievement, but also on their self-regulatory development. Assigning and encouraging college students to complete their homework can improve their self-efficacy beliefs about learning, which in turn leads students to take more responsibility for their academic outcomes. These findings could be pivotal in the retention of freshman college students in view of data showing that one out of every four freshmen who begin their studies at four-year colleges and universities does not return for the sophomore year (National Center for Higher Education Management Systems (NCHEMS 2007). Future research should focus on developing and testing the effectiveness of interventions that include the use of homework for freshman college students.

Appendix

Items of the SELF

1. When you miss a class, can you find another student who can explain the lecture notes as clearly as your teacher did?
2. When your teacher's lecture is very complex, can you write an effective summary of your original notes before the next class?
3. When a lecture is especially boring, can you motivate yourself to keep good notes?
4. When you had trouble understanding your instructor's lecture, can you clarify the confusion before the next class meeting by comparing notes with a classmate?
5. When you have trouble studying your class notes because they are incomplete or confusing, can you revise and rewrite them clearly after every lecture?
6. When you are taking a course covering a huge amount of material, can you condense your notes down to just the essential facts?
7. When you are trying to understand a new topic, can you associate new concepts with old ones sufficiently well to remember them?
8. When another student asks you to study together for a course in which you are experiencing difficulty, can you be an effective study partner?
9. When problems with friends and peers conflict with schoolwork, can you keep up with your assignments?
10. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work?
11. When you find yourself getting increasingly behind in a new course, can you increase your study time sufficiently to catch up?
12. When you discover that your homework assignments for the semester are much longer than expected, can you change your other priorities to have enough time for studying?
13. When you have trouble recalling an abstract concept, can you think of a good example that will help you remember it on the test?
14. When you have to take a test in a school subject you dislike, can you find a way to motivate yourself to earn a good grade?
15. When you are feeling depressed about a forthcoming test, can you find a way to motivate yourself to do well?
16. When your last test results were poor, can you figure out potential questions before the next test that will improve your score greatly?
17. When you are struggling to remember technical details of a concept for a test, can you find a way to associate them together that will ensure recall?
18. When you think you did poorly on a test you just finished, can you go back to your notes and locate all the information you had forgotten?
19. When you find that you had to "cram" at the last minute for a test, can you begin your test preparation much earlier so you won't need to cram the next time?

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