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Homework practices and academic achievement: The mediating role of self-efficacy and perceived responsibility beliefs

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Abstract

The present study investigated the role of students' homework practices in their self-efficacy beliefs regarding their use of specific learning processes (e.g., organizing, memorizing, concentrating, monitoring, etc.), perceptions of academic responsibility, and academic achievement. One hundred and seventy-nine girls from multi-ethnic, mixed socioeconomic status families residing in a major metropolitan area of the United States were studied in a parochial school that emphasized homework in the curriculum with more than 3 h of work assigned daily. Path analyses showed significant paths (a) from homework experiences to the girls' self-efficacy for learning beliefs and their perception of student responsibility for academic outcomes, and (b) from these two academic beliefs to the girls' academic grade point average at the end of the school term. The implications of these findings for future research and school policy will be discussed.

Keywords: Homework practices; Role of self-efficacy and perceived responsibility

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1. Introduction

A topic of considerable current interest among educators and psychologists is the impact of homework on students' academic functioning (e.g., Cooper & Valentine, 2001; Corno, 2000). Homework has been defined as "tasks assigned to students by school teachers that are meant to be carried out during non-school hours" (Cooper, 1989, p. 7). Researchers have discovered that homework completion is associated with increased understanding and retention of academic material. In a meta-analysis of experimental versus control group studies (Cooper & Valentine, 2001), the size of the effect of homework on achievement for high school students was $d = .64$, which is considered large. Furthermore, the size of the effect of homework on students' achievement levels during high school increased linearly above a threshold level of one hour of homework. Thus, the academic benefits of homework become increasingly evident as its role in the academic curriculum expands.

Several additional benefits of students' homework have been suggested, such as enhancing students' development as independent learners with better study skills, more positive academic attitudes, and greater responsibility toward learning (Cooper & Valentine, 2001), but these hypotheses have received relatively little empirical support to date. However, student outcomes, such as independence, study skills, and positive academic attitudes have been studied as elements of academic self-regulation, which is defined as self-generated thoughts, feelings, strategies, and behaviors designed to attain academic goals (Schunk & Zimmerman, 1998). The present research focuses on the role of homework experiences in students' self-regulation and willingness to accept responsibility for their academic functioning.

Homework grows in frequency and difficulty as students move from elementary school to college, and teachers assume greater self-regulation on the part of students with increasing grade levels (Cooper, Lindsay, Nye, & Greathouse, 1998; Zimmerman, 2002). The topic of academic self-regulation has been studied in a variety of contexts, such as learning-to-learn classes, subject matter content courses, academic tutoring sessions, and computerized instruction experiences (see chapters in edited books by Boekaerts, Pintrich, & Zeidner, 2000; Pintrich, 1995; Schunk & Zimmerman, 1994, 1998; Winne & Stockley, 1998; Zimmerman & Schunk, 2001), but the influence of homework on students' development of self-regulatory processes and beliefs has received relatively little attention to date. Because self-regulation of learning involves personal initiative and perseverance, there is an inherent motivational dimension to this construct (Zimmerman, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992).

Among the motivational beliefs that have been studied in connection with self-regulation, self-efficacy has been shown to play an especially important role (Pajares & Schunk, 2001). Self-efficacy refers to beliefs about one's capability to learn or perform effectively, and self-efficacy for learning refers to beliefs about using self-regulatory processes, such as goal setting, self-monitoring, strategy use, self-evaluation, and self-reactions to learn. Self-efficacy differs operationally from other self-related constructs in that self-efficacy items are phrased in terms of what students *can do* rather than what they *will do* or *usually do* in a particular domain (Bandura, 2001).

Although self-efficacy beliefs are a domain-specific construct, the scope of the domain can vary depending on the goal of the researcher (Pajares, 1996). For example, the domain could range from solving a single type of math problem (such as two-digit addition) to succeeding in the field of math in general. To assess students' functioning in various academic settings, Bandura (1989) developed two self-efficacy scales: a *self-efficacy for academic achievement* scale focusing on students' perceived capability to achieve on various academic tasks, such as mathematics, reading and writing, and *self-efficacy for self-regulated learning* focusing on students' perceived capability to engage in goal setting, planning, and organizing during academic studying. Bandura and his colleagues (Zimmerman et al., 1992) found that the students' self-efficacy for self-regulated learning beliefs were predictive of their self-efficacy for academic achievement beliefs, and the latter form of self-efficacy was in turn predictive of the students' grades. These findings imply that self-efficacy for learning items may be more predictive if they are adapted to academic tasks. In the present research, we developed a new scale called the Self-Efficacy for Learning Form (SELF) that focused specifically on students' beliefs about self-regulating various aspects of academic studying, such as reading, note taking, writing, test taking, and general studying. It is possible that separate but correlated self-efficacy factors might emerge for each form of studying.

Students' self-efficacy beliefs about their learning processes have been hypothesized to affect students' perceptions of personal responsibility for learning (Zimmerman, 1994). Self-efficacious students view themselves as proactive agents of learning experiences (Bandura, 1997), and as a result, they should view students (as a group) to be more responsible for academic outcomes than their teachers. In research on homework, Cooper et al. (1998) have attributed the greater responsibility reported by sixth grade students than second graders to the sixth graders' greater degree of self-regulation. Approximately 40 years ago, Crandall, Katkovsky, and Crandall (1965) developed a scale of Intellectual Achievement Responsibility, which was used in a number of studies. The internal consistency of that measure ranged only between .54 and .60, and its correlation with achievement tests above the fifth grade was poor. The scale has received little use in recent years. Because of these limitations, we decided to develop a scale with a new format in which students rated a range of academic outcomes along a scale of perceived responsibility ranging from student to teacher causation. Although an American Psychological Association (APA) task force on Psychology and Education has recently identified students' display of academic responsibility as a key educational goal for the 21st century (Sternberg, 2002), it found very little research on this topic. In a recent review of research on homework, Warton (2001) lamented the paucity of research on the effects of homework on students' development of personal responsibility. The present study will also assess the relation between assigned homework experiences on students' perceived responsibility as well their self-efficacy for learning beliefs.

There are two primary purposes of the present research: (a) to develop reliable instruments to assess the quantity and quality of students' homework practices; self-efficacy for learning, and perceived academic responsibility; and (b) to examine the mediational role of self-efficacy for learning and perceived responsibility beliefs

between students' homework reports and their academic achievement (GPA). To achieve the second purpose, a path analysis model is proposed (see Fig. 1). Specifically, we hypothesize that students' homework reports will predict their self-efficacy for learning beliefs, which turn will predict their GPA. 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 GPA 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., GPA).

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.

Research on the impact of homework on academic achievement (Cool & Keith, 1991; Trautwein, Koller, Schmitz, & Baumert, 2002) has revealed the need to include the influence of students' prior achievement. It is hypothesized that prior achievement will directly predict GPA because historically students' performance on standardized tests has been considered an optimal predictor of their subsequent success in school. Prior achievement is also expected to predict homework reports because of high achieving high school students spend more time on their assignments than low achieving students (Campbell, Hombo, & Mazzeo, 2000). In addition, high achieving students are hypothesized to form higher self-efficacy beliefs about their capability to learn on their own (Zimmerman et al., 1992) and to perceive students as more responsible for their academic success.

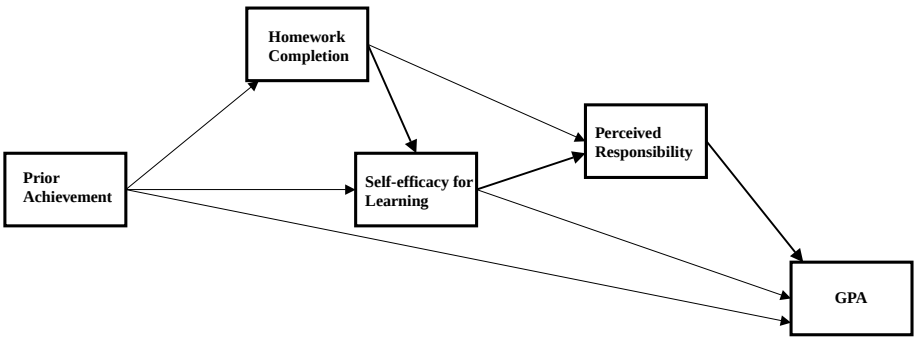

Fig. 1. Hypothesized path model for prior achievement effects on girls' homework reports, self-efficacy for learning, perceived responsibility, and academic grade point average.

2. Method

2.1. Participants

The entire student body of a parochial high school for girls ($N = 180$) participated in the study. Consent forms were sent to the parents of the students that explained the purpose of the study, the option that students could withdraw from the study at any time, and their responses would be kept confidential. Students who were absent during initial testing were tested within the following three weeks. A high level of student participation in the study was obtained because of administrators' interest in a formal study of the homework issue and because of traditionally high levels of student involvement at school events. The data from one student, who failed to complete the questionnaire, were dropped from the analyses, leaving 179 students in the final sample. The school, which was located in a large eastern city, enrolled girls who were diverse in ethnic composition: 44% White, 14% Black, 27% Hispanic, and 15% Asian/others. They ranged in age from 14 to 19 years with a mean age of 16 years. According to an index of occupations (Laosa, 1982), the girls were predominantly middle class: 41% of the girls were from upper middle class (professional and technical), 35% from lower middle class (white collar), 20% were upper lower class (blue collar), and only 4% were lower class (public assistance). The school was above average in academic selectivity: the mean percentile rank of the students was 85 on the National Educational Development Test (NEDT), a standardized measure of achievement, which was administered at the outset of the freshman year. This student body was selected because homework played a major role in the curriculum and because it would provide a definitive test of the effects of this academic experience. The girls' gender was not considered a primary issue because prior attitudinal research regarding homework (Cooper et al., 1998) did not reveal the presence of gender effects. All participants received extra credit toward their physical education grade for their participation in the study.

2.2. Measures

2.2.1. Personal data questionnaire

This brief questionnaire was developed to obtain information regarding the participants' age, year in school, and ethnicity. This questionnaire included a question asking the girls to indicate approximately how many hours of homework were assigned daily by their teachers, and they reported 3 h and 10 min (i.e., 190 min) in length. The girls' NEDT scores upon entrance to the high school and their GPA at the end of the current semester were obtained from school records. Although GPA has been used widely in educational research, teacher assigned grades may be criticized for involving subjective judgments of students' work efforts as well as their actual academic performance. GPA was included as the outcome measure in this study because it was a key basis for students' self-judgments of the effectiveness of their studying techniques.

2.2.2. Homework survey

This survey was composed of two separate multi-item scales of students' homework practices: one referring to quantity and the other quality. The *quantity of homework* scale is composed of two items dealing with amount of time spent in homework activities: "How much time do you spend on homework every day?" and a second item, "How much time do you spend studying for a chapter test?" Items in this scale were answered in open-ended format (in terms of hours). The first item is similar to the most widely used measure of students' quantity of homework in prior research (Trautwein et al., 2002), and it generally has been positively related to achievement outcomes among high school students (Cooper & Valentine, 2001). The *quality of homework* scale is composed of five items dealing with advantageous homework practices: "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?" The first three items involved dichotomous ratings (*yes* or *no*), and the second two items involved Likert scale ratings scale: 1 (never), 2 (seldom), 3 (often), 4 (usually), and 5 (always). To create a single qualitative scale, the latter two items were converted to dichotomous items by transforming ratings 1–2 to the *no* category and ratings 3–5 to the *yes* category. The *yes* answers were scored as two, and *no* answers were scored as one. The three dichotomous items emerged from informal unstructured interviews that were conducted with students and teachers. In the development of the scale during the spring before the study commenced, 16 graduating seniors and two teachers were asked individually to evaluate various combinations of potential questions for their clarity. These evaluations were unstructured and only four students responded to the final set of items. In some cases, they preferred an item with a dichotomous response format, and in other cases, they preferred an item with a Likert scale format. Although a Likert scale provides more response options than a dichotomous scale, the reliability of the quality of homework scale, which was composed of five dichotomous items, was quite high (see below). However, in retrospect, Likert format items would have been more sensitive to individual differences in homework quality than dichotomous items and are recommended for future research involving this scale.

The factorial structure of each homework scale was analyzed using an exploratory principal component analysis. For the quantity of homework scale, there was a single factor that accounted for 74% of the variance (eigenvalue = 1.24). The second factor had an eigenvalue of less than one and was not interpreted. Both items loaded above .61 on the first factor. The mean and standard deviation for items in the scale in hours was 3.12 and 1.03, respectively. The Cronbach α reliability coefficient for the scale was .64. For the quality of homework scale, there was a single factor that accounted for 62% of the variance (eigenvalue = 3.09). The second factor had an eigenvalue of less than one (.95) and was not interpreted. All items loaded above .53 on the first factor. The mean and standard deviation for items in the scale in hours was 1.70 and .34, respectively. The Cronbach α reliability coefficient for the scale was .79. The zero-order correlation between the two homework scales was .75.

2.2.3. Self-efficacy for learning form

This scale was designed to measure each participant's perceived self-efficacy regarding performing various forms of academic learning, such as reading, note taking, test taking, writing, and studying. The items of the scale were constructed to assess students' certainty about coping with various academic problems or contexts, such as having trouble concentrating on a reading assignment or having missed class. This item format was designed to be a demanding test for self-efficacy beliefs because it involves adapting to difficult learning conditions. These 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 girls responded using a scale that ranged from 0 to 100 points in 10-unit instruments. 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), and 100 (definitely can do it). Higher scores on this scale reflect more positive self-efficacy for learning beliefs. Bandura (2001) 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, Hartley, & Valliente, 2001). It was possible that items measuring self-efficacy for learning regarding reading, note taking, studying, test taking, and writing could form distinctive but correlated latent factors because the effectiveness of self-regulatory strategies is often affected by variations in academic tasks (Zimmerman & Martinez-Pons, 1988).

This newly developed scale was composed initially of 59 items. An exploratory principal component analysis yielded five factors, which together accounted for 84% of the variance. Factor 1 accounted for 66% variance (eigenvalue = 38.06). Factor 2 accounted for 8% of the variance (eigenvalue = 4.35). Factor 3 accounted for 6% variance (eigenvalue = 3.50). Factor 4 accounted for 3% variance (eigenvalue = 1.55). Factor 5 accounted for 2% variance (eigenvalue = 1.12). The slight disparity between the separate and total factor variance is due to rounding errors. All items displayed loadings above .60 on the first factor with the exception of two items. The first factor was labeled self-efficacy for learning. The remaining factors, which were relatively small in size, were not labeled because of the heterogeneity of the item content. There was no evidence that variations in the form of studying produced distinctive factors. Because of their poor loadings on factor one, the two items were dropped from the scale during subsequent analyses. The remaining 57 items were totaled to provide a single index of self-efficacy for learning. For these items, the factor loadings on the first (i.e., self-efficacy for learning) factor ranged between .68 and .91, and none of the items loaded above .40 on any subsequent factors. The communalities, which represent a conservative measure of item reliability, ranged between .69 and .91. These communalities indicate high reliability for the individual items in this scale. Four of the items (numbers 2, 8, 15, and 42) in the SELF involved the use of a negative in the text of the item (e.g., item two: "When you *don't* understand a paragraph you have read, can you clarify it by careful rereading?"), which could involve a double negative if a respondent chose

an negative option, such as 30% or "probably cannot." It should be noted that the 30% degree of confidence is not stated in negative terms—only the lexical meaning of that percentage (i.e., probably cannot). To determine whether such items were confusing, we examined the commonalities of the four items containing a negative in the text. The commonalities for these items ranged between .86 and .87, which indicate high levels of reliability. As a result of these analyses, the four items were retained in the scale. For the 57-item scale, the mean item score was 79.76, the standard deviation was 13.02, and the Cronbach α reliability coefficient was .99.

The validity of the SELF is established in the present study by its prediction of teacher ratings of actual student self-regulation behavior in class (Zimmerman & Martinez-Pons, 1988). Bandura (1997) has emphasized the distinctiveness of self-efficacy beliefs from the performances they predict: "perceived efficacy is not a measure of the skills one has but a belief about what one can do under different sets of conditions with whatever skill one possesses" (p. 37). Thus, self-efficacy beliefs about using self-regulatory strategies to surmount learning obstacles is distinctive from actually using these strategies. To assess the predictive validity of the SELF in the present study, the English teacher for each grade level (9th, 10th, 11th, and 12th) was asked to rate each student's self-regulation of learning by a 12-item scale single factor developed and validated by Zimmerman and Martinez-Pons (1988). These teachers were selected because every student in the school is enrolled in one of their classes. The teacher ratings were recorded at a later point during the semester after homework and self-belief measures were administered. In the present study, the Cronbach α reliability coefficient for the teachers' ratings was .96, and the correlation between this teacher rating measure of self-regulation and the student self-efficacy for learning measure was .72 indicating a significant degree of predictive validity for the self-efficacy scale.

2.2.4. Perceived responsibility for learning scale

This 18-item scale was designed to indicate whether the respondents perceived the student or the teacher was 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. They 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. Because all of the items in the scale dealt with students' perceptions of responsibility for academic learning, motivation, and behavior, and a common latent factor was expected.

To test for this common factor, an exploratory principal component factor analysis yielded three factors, which together accounted for 81% of the variance. Factor 1 accounted for 69% variance (eigenvalue = 13.83), factor 2 accounted for 7% variance (eigenvalue = 1.50), and factor 3 accounted for 5% variance (eigenvalue = 1.00). All items loaded above .70 on the first factor with the exception of two items. The first factor was labeled perceived responsibility, and the remaining factors, which were relatively small, were not labeled because of the heterogeneity of the item content. The two items with poor loadings on the first factor were dropped from the scale during subsequent analyses. The remaining 18 items were totaled to provide a single index of students' perceived responsibility for academic learning. For the revised scale, the mean item score was 5.21, the standard deviation was 1.21, and the Cronbach α reliability coefficient was .97.

2.3. Procedure

All girls and their parents signed an informed consent form. The scales were administered during a regular class period in the beginning of the second quarter of the school year. The girls were instructed to take their time in completing the surveys and to ask the test administrator if they had any questions. The total time to complete the surveys ranged from 30 to 40 min. Each of the grade level English teachers filled out the Teacher Rating Scale for Student Self-Regulated Learning (Zimmerman & Martinez-Pons, 1988) later during the academic quarter. The girls' NEDT scores upon entrance to the high school and their GPA at the end of the semester (which includes two academic quarters) were obtained from school records.

2.4. Research design for a predictive model for homework

Path analyses 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 correlated data, the role of intervening variables can be studied from path diagrams. The data reflect four sequential time points: NEDT test results upon entrance to high school, measures of homework and self-beliefs during the current academic semester, self-regulation measures that were obtained from the English teachers later during the first semester, and GPA that was obtained at the completion of the first semester. Because of the high correlation between the homework quantity and quality scales and the lower reliability of the quantitative scale, only the qualitative scale was used as an index of homework completion in the path analyses.

3. 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 & Mallery, 2001). These outcomes indicate that the use of parametric statistical procedures to analyze the data were appropriate.

We also conducted analysis of variance tests to determine whether the socioeconomic status (SES) of the students was related to the quality or quantity of their homework, their GPA, or their NEDT achievement. Across the four categories of parental occupations, there were no significant differences in homework quantity, $F(3/175) = .80$, *ns*, homework quality, $F(3/175) = .85$, *ns*, GPA $F(3/175) = .65$, *ns*, or NEDT achievement $F(3/175) = .55$, *ns*. As a result of these findings, the data were pooled across SES groups for subsequent analyses.

3.1. Path analyses

A path analysis was conducted to test the hypothesized mediating relations among the five observed variables in Fig. 1. Although we used the LISREL program (Joreskog & Sorbom, 1996) to analyze the data, our model was a path model not a structural equation model (SEM) because no latent variables were involved. The proposed model provided a good fit for the obtained results, with a $\chi^2(1) = 0.64$, $p < .42$, (NFI = .99, CFI = .99, and RFI = .99). The results from the path analysis of the proposed model are presented in Fig. 2. The exogenous NEDT measure of prior achievement predicted the quality of the girls' homework practices, self-efficacy for learning, perceived responsibility, and GPA significantly. As was hypothesized, the paths from the quality of homework to self-efficacy for learning, from self-efficacy to perceived responsibility, and from that construct to GPA were statistically significant and quite substantial in size. The paths between homework and perceived responsibility and between self-efficacy and GPA also were also significant but were much smaller in size.

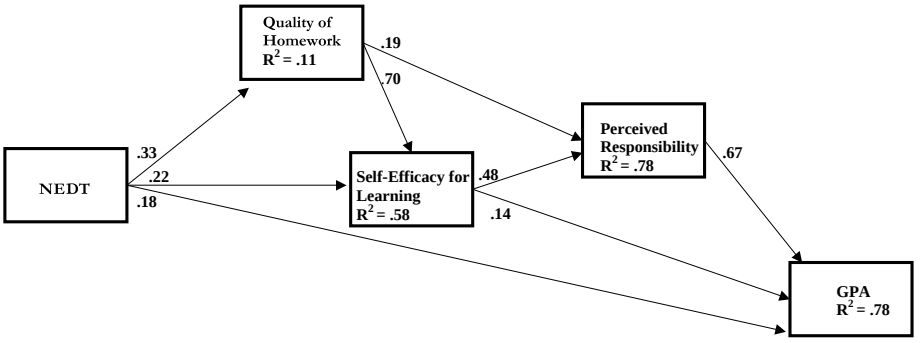

Fig. 2. Path coefficients for prior achievement effects on girls' homework reports, self-efficacy for learning, perceived responsibility, and academic grade point average. All path coefficients are statistically significant at ($p < .05$).

Table 1
Decomposition of total (*T*), direct (*D*), and indirect (*I*) effects of variables from the path analysis

Predictor variable	Predicted variable			
	2	3	4	5
NEDT	$T = .33$	$T = .37$	$T = .50$	$T = .57$
	$D = .33$	$D = .14$	$D = .26$	$D = .18$
	$I = .00$	$I = .23$	$I = .24$	$I = .39$
Quality of homework		$T = .70$	$T = .52$	$T = .45$
		$D = .70$	$D = .18$	$D = .00$
		$I = .00$	$I = .34$	$I = .45$
Self-Efficacy for learning			$T = .48$	$T = .46$
			$D = .48$	$D = .14$
			$I = .00$	$I = .32$
Perceived responsibility				$T = .67$
				$D = .67$
				$I = .00$
GPA				

The decomposition of the direct and indirect effects of the variables is listed in Table 1. The direct effect of the girls' prior NEDT achievement on their GPA was small ($p = .18$), but the indirect effect was larger ($p = .39$). This indicates most of the variance in prior achievement was mediated through homework related variables in the model. The effect of homework quality on GPA ($p = .45$) was mediated entirely through their girls' self-efficacy beliefs and perceived responsibility. The effects of self-efficacy was primarily mediated through perceived responsibility ($p = .32$) although it did exert a significant direct effect as well ($p = .14$).

Because 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 second path model: the two self-beliefs were positioned as causal variables, and homework served as the intervening variable when predicting the students' GPA outcomes. This reverse model did not provide a good fit for the data, $\chi^2(2) = 101.24$, $p < .001$, NFI = .75, CFI = .75, and RFI = .25 indicating that homework experiences influenced the students' self-beliefs rather than the reverse. A second issue concerns the direction of causality between self-efficacy and perceived responsibility beliefs in the proposed model. In a third path model, the direction of the causal arrow between these two variables was reversed, with perceived responsibility predicting self-efficacy. This model also provided an acceptable fit for the data, $\chi^2(1) = .64$, $p = .42$, NFI = .99, CFI = .99, and RFI = .99, indicating that the causality can flow in either direction between these two mediational self-beliefs.

3.2. 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

Table 2
Means, standard deviations, kurtosis, skewness, and zero-order correlations

Variable	*M*	*SD*	K	S	1	2	3	4	5	6
Quality of homework	1.70	.34	−.66	−.68	1.00					
Quantity of homework	3.12	1.04	−.92	.09	.75	1.00				
Self-Efficacy for learning	79.70	13.01	−.86	−.47	.75	.74	1.00			
Perceived responsibility	5.21	1.21	−1.62	−.16	.63	.74	.71	1.00		
GPA	85.26	8.59	−.81	−.48	.57	.71	.68	.86	1.00	
NEDT	18.95	3.42	−.31	.14	.33	.39	.37	.50	.57	1.00

All correlations $p < .01$.
K, kurtosis; S, skewness.

all variables significantly predicted the girls' GPA at the end of the academic semester (which includes two quarters). Furthermore, GPA correlated .57 with the NEDT measure indicating that teacher-assigned grades were significantly associated with a standardized measure of achievement before entering high school.

4. Discussion

4.1. Psychometric properties of new instruments

The first purpose of the present research was to develop reliable instruments to assess students' homework practices, self-efficacy for learning, and perceived academic responsibility. The finding that the quantity of students' homework was highly correlated with its quality is important. The quantity of homework completion has been studied extensively in prior research using a measure that is similar the one in present study (Trautwein et al., 2002). This high correlation between quality and quantity of homework indicates that students who studied more were more likely to have a regular time and place to study, to estimate the time needed to complete their assignments, to set task priorities, and to compete their daily assignments successfully. The path analyses suggest that students who engage in high quality study methods are more likely to feel self-efficacious about their effectiveness as learners and to ascribe more responsibility to learners than teachers.

Although self-rating items have been used extensively in prior research on homework completion, daily logs have also been used. These logs have the advantage of recording studying at the time it happens rather than later from memory. However, in practice, many students fail to fill out the logs or often will do so from memory when asked to submit them. In a recent study by Plant, Ericsson, Hill, and Asberg (2005), only 60% of college students turned in logs of their studying. Furthermore, more than half of the students who turned in their log reported that the week-long recording period was not representative of their normal studying. Finally, the logged measure of study time correlated .61 with a questionnaire measure. These results suggest that questionnaire measures of studying are quite highly predictive of log measures and have benefits in their own right.

Regarding the SELF scale, it was possible that correlated factors would emerge for self-efficacy in each academic context—namely, for reading, note taking, writing, test taking, and general studying, but a principal components factor analyses of SELF items revealed a single large factor. All retained items loaded above .68 on this factor indicating that girls who felt self-efficacious about one aspect of academic functioning felt similarly about performing the other activities. Because all of the five academic activities assessed in the SELF are performed during the girls' extensive homework assignments, it is possible that these activities became closely integrated. In light of the single factor structure of the SELF and its high reliability ($\alpha = .99$), it is likely that a shorter version of the scale could be used with equal effectiveness in future research.

The predictive validity of the SELF was established in the present study by its substantial correlation ($r = .72$) with a previously validated teacher rating measure of girls' self-regulated learning (Zimmerman & Martinez-Pons, 1988). This teacher-rating represents a challenging criterion of validity because it involved observations of girls' self-regulation by different participants. The importance of girls' self-efficacy for learning beliefs is also evident in its substantial zero-order correlation with their GPA ($r = .68$). The high level of prediction of GPA afforded by the SELF may be traced to the type of item format that was involved. These items were more than simple judgments of whether the respondent felt efficacious about using a strategy; they also involved coping with difficult learning situations, such as distractions or anxiety. In this way, the SELF sought to extend beyond girls' self-beliefs about their procedural knowledge and skill (e.g., about using learning strategies) to include their conditional self-efficacy beliefs (e.g., about overcoming specific learning problems). Despite the challenging conditions for learning described in the items, the girls' mean response was nearly 80% on the scale, which is higher than a self-efficacy judgment of "Probably Can" (i.e., 70%).

Because the format of SELF items involves overcoming widely reported difficulties that students may encounter when learning, it might be asked, what if a student never experienced those particular difficulties? As we noted earlier, self-efficacy items are not designed to measure students' prior functioning but rather their prospective belief about handling future events. Although prior experience undoubtedly is considered when making self-efficacy judgments regarding future situations, Bandura (1997) cautions that such experience may be of limited relevance. Consider item 14 of the SELF: "when you have missed several classes, can you make up the work within a week?" Regardless of whether students had previously missed several classes or not, they can rate their belief about making up the work within the allotted time. If students misunderstood the prospective quality of the SELF items, they would display variability in responding to items based on their experiences with the difficulties in question. The inter-item consistency of the SELF was extremely high, suggesting that the students did not misinterpret the items.

A second issue regarding the items of the SELF concerns whether the use of a negative term (e.g., can't or don't) in the format of a few SELF items could have been confusing to the students, especially those rating their self-efficacy level negatively (e.g., 30% or probably cannot). Item analyses revealed the items containing a negative

term displayed high communalities, which is a conservative measure of item reliability. These items appear to have functioned appropriately during the study.

The newly developed perceived responsibility scale also appears to have attractive psychometric properties. Principal components factor analyses of the perceived responsibility scale revealed a single large factor and all retained items loaded above .70 on this factor. The Cronbach α internal consistency reliability for the scale was very high at .97. In terms of its validity, the perceived responsibility scale displayed both convergent and discriminant validity in predicting the girls' GPA. Regarding its convergent prediction, the perceived responsibility scale correlated with GPA more highly than any other measure in the present study ($r = .86$), and regarding its discriminative prediction, the decomposition analyses revealed that perceived responsibility predicted 22% more of the variance in GPA than girls' homework practices. Perceived responsibility is clearly an important motive for academic achievement emerging from homework experiences. The mean response was 5.21% on the scale, which is above "slightly more student responsibility" (5) on the seven-point scale for both unfavorable and favorable learning processes and outcomes than the teacher. These items included perceived responsibility for 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).

Because of the high correlation between perceived responsibility and self-efficacy, it might be asked whether the two constructs are distinctive. Operationally, self-efficacy is a judgment of personal capability whereas perceived responsibility is a judgment of the accountability of others (e.g., students and teachers as separate groups). A student may not feel self-efficacious about motivating themselves to increase their study (item 42 of SELF) but may feel that students are more responsible than teachers for "going through the motions without trying." Although the causal priority of these two mediators of homework influences is unclear from the path analyses, each of the measures predicted unique variance in the girls' GPA. Thus, the two measures are operationally and empirically distinctive.

Despite widespread general interest in assessing students' development of academic responsibility (Sternberg, 2002) and particular interest in assessing the role of homework on students' development of academic responsibility (Warton, 2001), there has been very little definitive empirical research regarding this motivational belief. The present study reports clear evidence that girls' reports of homework practices and self-efficacy beliefs predict a unitary factor measure of perceived responsibility.

4.2. A model of homework practices, self-beliefs, and academic achievement

The second goal of this research is to examine the mediational role of self-efficacy for learning and perceived responsibility beliefs between their girls' homework reports and their academic achievement (see Fig. 1). The path analysis revealed a significant path from the quality of the girls' homework to their GPA via their self-efficacy and perceived responsibility beliefs (see Fig. 2). Furthermore, the decomposition data in Table 1 reveals the direct path between homework and GPA was zero

($p = .00$), but the indirect path via self-efficacy for learning and perceived responsibility was significant ($p = .45$). The reverse hypothesis that the girls' homework mediated the effects of their self-beliefs on GPA was not supported by the results of a second path analysis.

A second reverse hypothesis concerned the direction of causality between the girls' self-efficacy and perceived competence beliefs. The first path analysis (see Fig. 2) revealed significant effects of the girls' self-efficacy beliefs on their perceptions of responsibility as well as on their GPA. However, the data from a third path model revealed that the reverse hypothesis was also true: the girls' perceptions of responsibility predicted their self-efficacy beliefs as well as their GPA. Because path analysis does not provide a direct test of causality (which involves manipulation of an independent variable) but rather compares the viability of potential causal models, it is possible that more than one model may emerge from these analyses as viable. In the case of the present study, experimental research is needed to resolve definitively the issue of causality between self-efficacy and perceived responsibility beliefs. However, the issue of the direction of causality between these two mediating beliefs may be less important than evidence that each belief predicts the other as well as unique variance in the girls' GPA.

4.3. Limitations

When interpreting the size of the effect of these two mediational beliefs on the girls' GPA, we caution that the parochial school that we studied was academically selective and emphasized homework assignments as an important pathway for learning. The girls reported daily homework assignments of 3 h and 10 min in length, and these judgments corresponded to the school's homework requirements. The teachers' guidelines for assigning homework recommended 30 min of daily homework for each academic class. The girls enrolled in seven courses per term, and this sums to 3 h and 30 min per person daily. Furthermore, the variability of the girls' assigned homework time judgments was small ($SD = .79$), and this indicates high levels of agreement in these time judgments among the girls. When considering the girls' distribution of time judgment scores (based on the mean and standard deviation), we calculated that 65.4% of the girls gave estimates of 3 or more hours of assigned homework. Thus, there is clear evidence that the daily homework assignments exceeded three hours in length. Clearly teachers in this school placed great emphasis on their girls' completion of homework. Because of the distinctive qualities of this school, readers should be cautious about generalizing these findings to schools that are less selective or give less emphasis to the role of homework. In such schools, students' perceptions of their teachers' homework practices may be less predictive of students' homework practices, and students' homework experiences may well play a weaker role in their self-efficacy for learning beliefs and perceived academic responsibility. This issue should be explored in future research.

A second limitation of the present research is that the parochial school studied did not enroll boys, and thus, the implications of the present findings for co-educational public schools remains unknown. This parochial school was selected because

homework played a major role in the curriculum and because this sample would provide a definitive test of the effects of this academic experience. The issue of gender differences in homework completion is a topic that should be explored further in future research. Although the SES of these parochial school girls was above that of students attending many urban public schools, it should be noted that no significant SES differences were found in homework quality, homework quantity, GPA or NEDT, indicating that the SES was not an issue when interpreting the findings.

A third limitation concerns the role of parents. In prior homework research, there is evidence that parental involvement is related positively to children's attention to homework, homework completion, and quality of homework performance (Balli, Demo, & Wedman, 1998; Callahan, Rademacher, & Hildreth, 1998; Forgatch & Ramsey, 1994; Hutsinger, Jose, & Larson, 1998). Parents are also believed to enhance their children's appreciation of education by expressing positive attitudes toward their children's achievement (Cooper & Valentine, 2001). The influence of parents on their children's homework experiences, self-efficacy beliefs, and perceived responsibility is an important issue that will be pursued in future research. In such research, the inclusion of parents' judgments of their children's homework time and efforts would be helpful in interpreting students' judgments.

5. Conclusion

Although there is substantial evidence of the positive influence of homework on students' academic achievement, relatively little research has been reported regarding the potential self-regulatory benefits of homework. The present research revealed that the girls' homework practices were predictive of their self-efficacy beliefs regarding their ability to learn and their perceptions of responsibility for learning. The latter two variables were found to play an important mediational role between students' homework practices and their GPA. Because much is known about how the self-efficacy beliefs of learners can be enhanced during academic learning (Bandura, 1997; Pajares & Schunk, 2001; Zimmerman, 1995), the present empirical demonstration of the mediational role of these self-empowering beliefs may have special value for educators interested in increasing impact of their homework assignments.

Appendix A. Self-efficacy for learning form

Definitely *cannot do it*			Probably *cannot*		Maybe		Probably *can*			Definitely *can do it*
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Choose a percentage to indicate your answer

_____1. When you notice you are having trouble concentrating on a reading assignment, can you refocus your attention and learn the material? (R)

_____2. When you don't understand a paragraph you have just read, can you clarify it by careful rereading? (R)
_____3. When you have trouble recalling key facts in a reading assignment, can you find a way to remember all of these two weeks later? (R)
_____4. When you have trouble remembering complex definitions from a textbook, can you redefine them so that you will recall them? (S)
_____5. When you feel very anxious before taking a test, can you remember all the material you studied? (T)
_____6. When you have tried unsuccessfully to study for an hour, can you set and attain an important study goal during your remaining time? (S)
_____7. When you are given an extensive reading assignment to cover before class the next day, can you set aside enough time in your schedule to finish it? (R)
_____8. When you don't understand your teacher, can you ask the right question to clarify matters? (N)
_____9. When your teacher gives a rambling disorganized lecture, can you reorganize and rewrite your notes before the next class meeting? (N)
_____10. When you find your homework assignments vary greatly in length each day, can you adjust your time schedule to complete them? (S)
_____11. When you notice that your notes are much less complete than another student's, can you write down all the teacher's points during the next lecture? (N)
_____12. When you notice that you are getting behind in your homework during the week, can you catch up during the next weekend? (S)
_____13. When another student asks you to study together for a course in which you are experiencing difficulty, can you be an effective study partner? (S)
_____14. When you have missed several classes, can you make up the work within a week? (S)
_____15. When you find the assignment you are reading doesn't make sense, can you interpret it by using text clues, such as headings or italics? (R)
_____16. When you miss a class, can you find another student who can explain the lecture notes as clearly as your teacher did? (N)
_____17. When problems with friends and peers conflict with school work, can you keep up with your assignments? (S)
_____18. When the assigned reading is boring, can you find a way to motivate yourself to learn it fully? (R)
_____19. When a homework assignment, such as learning vocabulary words, is repetitive and uninteresting, can you make it into an exciting challenge? (S)
_____20. When an assigned reading is poorly written, can you figure out its meaning so you can explain it well on an essay test? (R)
_____21. When a teacher's lecture is over your head, can you find a way to get the information clarified before the next class meeting? (N)
_____22. When your teacher's lecture is very complex, can you write an effective summary of your original notes before the next class? (N)
_____23. When you are having trouble understanding assigned reading material, can you find a classmate who can explain everything clearly to you? (R)

_____24. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work? (S)
_____25. When you are trying to understand a new topic, can you associate new concepts with old ones sufficiently well to remember them? (S)
_____26. When a lecture is especially boring, can you motivate yourself to keep good notes? (N)
_____27. When you are having trouble comprehending a reading assignment, can you find key sentences that will help you understand each paragraph? (R)
_____28. 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? (T)
_____29. When you have time available between classes, can you motivate yourself to use it for studying? (S)
_____30. 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? (N)
_____31. When you feel anxious during an exam and have trouble controlling information, can you relax and concentrate well enough to remember it? (T)
_____32. When you are feeling depressed about a forthcoming test, can you find a way to motivate yourself to do well? (T)
_____33. When you are tired, but have not finished writing a paper, can you find a way to motivate yourself until it is completed? (W)
_____34. When you suddenly realize that you can't remember any material you have read during the last half hour, can you create self-questions to help you review the material successfully? (R)
_____35. When you find yourself putting off writing of an assigned paper, can you motivate yourself to begin the task immediately? (W)
_____36. When you have trouble recalling an abstract concept, can you think of a good example that will help you remember it on a test? (T)
_____37. When your friends want to see a movie when you need to study for a test, can you find a way to decline without offending them? (T)
_____38. When your last test results were poor, can you figure out potential questions before the next test that will improve your score greatly? (T)
_____39. When you are taking a course covering a huge amount of material, can you condense your notes down to just the essential facts? (N)
_____40. When you find yourself getting increasingly behind in a new course, can you increase your study time sufficiently to catch up? (S)
_____41. 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? (T)
_____42. When your teacher lectures so rapidly you can't write everything down, can you record all the important points in your notes? (N)
_____43. When you are angry about a course because of a teacher's demanding requirements, can you find a way to channel your anger to help you succeed? (S)
_____44. When your concentration wanders while writing an important paper, can you refocus it sufficiently to finish the paper on time? (W)

_____45. When describing a complex principle in a written paper, can you create an analogy that a reader will understand? (W)
_____46. When you find that your first draft of a paper is wordy, ungrammatical, or confusing, can you revise it so that it is completely clear and grammatical? (W)
_____47. When you are asked to write a concise, well-organized paper over night, can you find a way to do it? (W)
_____48. When you are dissatisfied with an important paper you are writing, can you find another person who will show you how to remove all the problems? (W)
_____49. When you are asked to write a paper on an unfamiliar topic, can you find good enough information to please your teacher? (W)
_____50. When you learn that a paper you just finished writing is confusing and needs to be completely rewritten, can you delay your other plans for a day to revise it? (W)
_____51. 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? (S)
_____52. 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? (T)
_____53. When you are struggling to remember the details of a complex reading assignment, can you write summary notes that will greatly improve your recall? (R)
_____54. 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? (T)
_____55. When other students from your class emphasize parts of the teacher's lecture that you excluded from your notes, can you correct this omission before the next class meeting? (N)
_____56. When you are struggling to understand a body of information for a test, can you diagram it or chart it so you will remember it all two weeks later? (T)
_____57. When you have trouble studying your class notes because they are incomplete or confusing, can you revise and rewrite them clearly after every lecture? (N)

R, reading item.
S, study item.
T, test preparation item.
N, note-taking item.
W, writing item.

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