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Homework self-regulation: Grade, gender, and achievement-level differences

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ABSTRACT

The study examined differences in students' reported homework value, motivation, and metacognitive strategy use during homework completion among two grades, gender, and three achievement levels. Differences among six homework self-regulation constructs (utility value, intrinsic value, effort, persistence, planning, and self-checking) were also examined. Participants were 330 seventh and 407 eleventh graders from a metropolitan city in China. Chinese students' reported self-regulated learning during homework declined from middle to high school. Whereas students rated utility value and effort high, intrinsic value and self-checking were rated low. Male and female students did not differ in homework self-regulation. Achievement-level differences in homework self-regulation were found in seventh graders, but not in eleventh graders. The pattern of Chinese students' reported homework value, motivation, and metacognitive strategy use were discussed, and instructional implications were offered.

1. Introduction

Homework is a frequently used educational activity. Among the purposes of homework assignments are support for academic learning and for the development of academic skills (e.g., responsibility). Although students' intellectual ability and overall motivation apply similarly to learning activities at school and home at any given time, learning at home is affected by various factors that are unique to each student. Home environment, family, and friends shape the learning conditions under which students engage in homework, and various out-of-school activities compete for students' time and effort (Hong & Milgram, 2000). Thus, students who are responsible for their own learning and regulate their homework behaviors should have a better chance of experiencing successful homework completion (Cooper, Lindsay, Nye, & Greathouse, 1998).

As students progress through school, they experience changes in types, amount, and purposes of homework assignments (Cooper, Lindsay, & Nye, 2000). Likewise, students' perceptions of homework change. Whereas young children see the purpose of homework as an aid to learning, older children have narrow views of homework's purposes (e.g., revise previously learned material) (Warton, 1997). Older than younger children consider homework boring and meaningless (Hong, Topham, Carter, Wozniak, Tomoff, & Lee, 2000). Younger children report that they enjoy schoolwork and are happier in school more so than older children (Bryan & Nelson, 1994). Furthermore, how much children like school is positively related to how much children liked homework (Chen & Stevenson, 1989). With older students receiving more homework and liking school and homework less (Bryan & Nelson, 1994; Polloway, Epstein, Bursuck, Jayanthi, & Cumblad, 1995), it is important to examine how students in different grade levels value and approach homework.

Given the variations in homework effects across grade level and the importance of students' responsibility for successful homework experience (Corno, 1996; Warton, 2001), it is important that educators understand whether students regulate their homework behaviors. Self-regulation applied in homework may be examined as a specific facet of responsibility (Warton, 1997). Although self-regulated learning has been studied widely (e.g., Pintrich & De Groot, 1990), self-

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regulation applied to homework has rarely been examined (Xu & Corno, 2003).

1.1. Self-regulated learning

According to the social cognitive view (Zimmerman, 2000), self-regulation is thoughts, affects, and behaviors used to attain learning goals. The main tenet of self-regulated learning is that students learn more effectively when they are responsible for their own learning (Schunk, 2001). According to Zimmerman and Bandura (1994), self-regulated learners enlist self-reactive influences to motivate their efforts and employ appropriate strategies to achieve success.

In the current study, we focused on motivational and metacognitive components drawn from modern conceptualizations of self-regulated learning originated from the social–cognitive perspective of self-regulated learning (Zimmerman, 2000). More contemporary models of motivation have been advanced that emphasize constructs such as task value, interest, and self-efficacy that affect motivational process and outcome (e.g., Wolters, 2003). Self-regulated learners are motivated as they view tasks associated with learning as valuable and interesting, are highly self-efficacious, expend effort to achieve goals, and demonstrate persistence when they encounter difficult tasks (Bandura, 1993; Corno, 2001; Pintrich, 2000). Self-regulated learners use effective metacognitive strategies such as planning learning activities, monitoring learning processes, and regulating the use of cognitive strategies (Pintrich, Wolters, & Baxter, 2000).

Students' motivational beliefs (e.g., task value, self-efficacy) and motivational outcome (e.g., effort expenditure) are positively related to the use of cognitive and metacognitive strategies (Pintrich & Schunk, 2002; Schunk, 2001; Wigfield, 1994). Bandura (1993) asserts that self-directed learning requires motivation as well as cognitive and metacognitive strategies. Zimmerman (1990) describes the cyclical relationship between motivational and metacogntive components of self-regulaton by positing that a learner's use of cognitive and metacognitive strategies enhances perceptions of self-efficacy, which in turn are assumed to provide the motivational basis for further self-regulation during learning. Thus, as students learn to self-regulate their learning, they become independent learners, taking responsibility for their own learning.

For the purpose of the study, we define that self-regulation operates through subsets of psychological functions that include motivational beliefs (e.g., valuing), motivational process and outcome (e.g., effort), and cognitive and metacognition (e.g., self-monitoring strategy). Thus, self-regulated learners appraise tasks (e.g., homework) and direct and monitor their own behaviors by motivating their efforts, being persistent when they encounter difficulties, and utilizing appropriate cognitive and metacognitive strategies in order to complete tasks successfully.

Of the many component constructs of self-regulated learning, we examined six that are viewed as important in homework situations: motivational beliefs focusing on task value separated into *utility value* and *intrinsic value*, motivational outcome represented by *persistence* and *effort expenditure*, and metacognitive strategy use manifested in *planning* and *self-checking*. Literatures on these constructs of self-regulated learning in school and home contexts and their relations with age, gender, and achievement are reviewed.

1.1.1. Task value: Utility and intrinsic value

Task value is students' motivational beliefs that the task (e.g., homework) is important and useful (utility value) or interesting and enjoyable (intrinsic value) (Wigfield & Eccles, 1992). Tasks that are intrinsically valued have shown positive relationships to achievement (Lepper, Corpus, & Iyengar, 2005). Likewise, students' utility values of homework and grades are positively related (Xu, 2005).

Students' motivation for school tasks declines as they progress through school (Wigfield et al., 1997), with noticeable declines in mathematics, followed by science and reading (Gottfried, Fleming, & Gottfried, 2001). Others (e.g., Fredricks & Eccles, 2002) have observed a similar trend in intrinsic and utility values in mathematics. Male and female students are similar in their ratings of either intrinsic or utility value in mathematics in some studies (Wigfield et al., 1997), whereas in others, males report higher utility or intrinsic value than do females (Forgasz, 1995; Watt, 2004).

Gender differences in task value are moderated by age. In Fredricks and Eccles (2002) female students' intrinsic valuing of mathematics shows greater declines than males', although no gender difference is found in utility values. In another study, however, female students have higher values than males in mathematics, except in late elementary to early secondary years when gender difference is not found (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002).

1.1.2. Motivational outcome: Effort and persistence

Effort and persistence have shown positive relationships with academic performance (Awang-Hashim, O'Neil, & Hocevar, 2003; Obach, 2003). Effort attributions for academic achievement decrease in the middle level (Moely, Obach, Cassell, & Tonglet, 1995). Persistence level also declines from grades 5 to 8 in homework (Hong & Milgram, 2000). In a longitudinal study of early childhood motivation, girls' persistence were stable across time (ages 2 and 8), and at age eight girls were significantly more persistent than boys with a task requiring sustained effort (Gilmore, Cuskelly, & Purdie, 2003). Likewise, females are more persistent in academic pursuit than males (Martin, 2004). However, in Pajares and Graham (1999) gender differences are not found.

1.1.3. Metacognitive strategy use: Planning and self-checking

The relationship between the use of self-regulatory strategies and achievement has been evidenced (Kitsantas, 2002). Low achievers have difficulties applying self-regulatory strategies in completing homework (Bryan, Burstein, & Bryan, 2001). Planning strategies prior to and during tests are associated with high test performance (Kitsantas, 2002). Similarly, monitoring and perceived academic competence are positively related (Obach, 2003). However, a few studies have found no significant relationship between the use of metacognitive strategies and achievement (e.g., Malpass, O'Neil, & Hocevar, 1999).

Young students, as compared to older students, are not skilled at using metacognitive strategies (Pressley & Ghatala, 1989). In homework, a developmental progression is shown in students' understanding of their responsibility for homework such as remembering to do homework (Warton, 1997). Gender differences are observed in self-regulated strategy use, with females reporting the use of self-regulated strategies more often than males (Ablard & Lipschultz, 1998; Martin, 2004).

Domain specificity versus generality has been an issue in examining the impact of student behavior on learning (Hofer, 2000). Schraw, Dunkle, Bendixen, and Roedel (1995) contend that general cognitive skills serve an important metacognitive role beyond the effect of domain-specific skills and knowledge. Others (e.g., Borkowski & Muthukrishna, 1992) have asserted that domain-general metacognitive skills are gradually generalized to become trait-like skills from the experience of using state metacognitive skills. The structure of trait and state self-regulation are invariant, and trait and state measures are highly correlated (Hong, 1995, 1998). In this study, we examined domain-general self-regulated learning applied to homework.

1.2. Self-regulated learning and homework in Chinese students

Studies of self-regulated learning with Chinese elementary or secondary students are rare. To our knowledge, there are two studies examining Chinese students in Hong Kong. In Salili and Lai's study (2003), students enrolled in schools for low achievers used fewer self-

regulated learning strategies as compared to students who attend schools for high achievers. However, this difference was not evident in older students (Rao, Moely, & Sachs, 2000).

Chinese students, as compared to their U.S. peers, were reported as having more positive attitudes about homework and spending more time on homework (Chen & Stevenson, 1989; Hong et al., 2000). The Chinese school system is highly examination driven and requires that scores from national examinations are utilized for transition decisions from middle to high school and from high school to college (China Ministry of Education, 2006). Recently, however, China has been undergoing significant economic and socio-cultural changes (Webber, Wang, & Zhu, 2003; Yao, 2006). How these changes might have influenced Chinese students' experiences within the educational system or their views about homework is unknown at present. Research on homework self-regulation with Chinese students is pertinent due to the high level of interest in homework by parents and teachers and to schools that place a high utility value on homework (Dandy & Nettelbeck, 2002; Ebbeck, 1996).

1.3. The current study

Given the importance of students' responsibility for successful homework completion, whether students apply self-regulation during homework needs to be determined. Based on varied learning conditions under which students engage in homework, a study of homework self-regulation will be an important addition to the existing literature on self-regulated learning.

Chinese students' as well as their parents' attitudes toward homework are different from those of other countries. By examining students of mainland China, the study adds cultural aspect of self-regulation in homework. We also examined the difference in homework self-regulation between middle and high school years as well as differences across varied levels of achievers and gender. The study will help determine whether the findings from this study would be similar to previous findings with students of other countries.

We examined differences in Chinese students' homework task value (*utility value*, *intrinsic value)*, motivational outcome (*effort*, *persistence*), and metacognitive strategy use (*planning*, *self-checking*) during homework among two grades, gender, and three achievement levels in mathematics. That is, whether the homework self-regulation profiles are consistent across these groups was of interest. Differences among the six homework self-regulatory constructs were also examined to determine Chinese students' perceived importance of these constructs. Specifically, we examined whether: (1) scores of the six component constructs of homework self-regulation (SR) were different; (2) homework SR score differences were moderated by grade, gender, and/or achievement-group differences; (3) group differences were significant on overall homework SR scores; and (4) each of these group effects were moderated by other group characteristics.

2. Method

2.1. Participants

Participants were from four schools in Guangzhou, a major metropolitan city in southern China. The four schools were similar in student achievement and socioeconomic status. The 368 seventh graders in two schools and 437 eleventh graders in the other two schools who were present on the day of data collection were invited to participate in the study. With 18 participating classes, 805 students were the initial sample. After inspecting their completed questionnaires, 38 from Grade 7 and 30 from Grade 11 were eliminated due to the following: not completing a page or two, showing insincerity in their responses (e.g., all "3"s on one page and all "2"s on another), missing final examination scores, or multivariate outliers (11 cases), leaving 330 seventh and 407 eleventh graders.

3. Measures

Self Assessment Questionnaire: Homework (*SAQ: Homework;* Author, 2005). To measure students' homework *utility value*, *intrinsic value*, *effort, persistence*, *planning,* and *self-checking* applied during homework process, the *SAQ: Homework* was used. The questionnaire consisted of 34 items. Examples of the items are: "Homework provides me with more chances to learn in depth" (*utility value*; 7 items); "I like doing any kind of homework" (*intrinsic value*; 6 items); "I work as hard as possible on my homework assignments" (*effort*; 6 items); "When problems arise as I do my homework, I like to keep working until I solve them" (*persistence*; 6 items); "I think through the steps required to complete homework assignments in my mind before I begin to work on them" (*planning*; 4 items); "I keep track of my progress while I am working on homework assignments" (*self-checking*; 4 items). Questionnaire items on motivation and metacognition were adopted from a well-established instrument (see O'Neil, Sugrue, Abedi, Baker, & Golan, 1992, and Hong, O'Neil, & Feldon, 2005, for the history of instrument development and validation results). Items were modified to fit homework situations.

Participants rated themselves on the following scale: (1) *Not true at all*, (2) *Somewhat true*, (3) *Often true*, and (4) *Very true*. Internal consistency estimates (coefficient alpha) of scores for the six constructs ranged from.55 to.81 for 7th graders and from.57 to .78 for 11th graders (see Table 2). The lowest reliability estimates (.55 and .57) were found in planning in both grades; all other estimates were higher than .60. The low reliability estimates of *planning* are partly due to the small number of items, along with other reasons presented in Discussion. The questionnaire was translated and back-translated; this process continued until all translated items were considered satisfactory.

3.1. Test scores

The final examination scores on mathematics were collected for participating students. The final examination tests were developed by all teachers jointly who taught the subject. Accordingly, the same test was used in each grade within each school. Students in all participating schools used identical textbooks. The mathematics final examination consisted of word problems and multiple choice and fill-in-the-blank items, which are typical mathematics exam items used in Chinese schools. The final examination scores were used instead of overall mathematics grades because the grading system across the four participating schools may not be as consistent as the final examination which was given to all students of the four schools within two weeks of the same month. Score distributions were examined within each school, and six outliers (z scores larger than |3|) were treated by moving the scores next to the closest smallest/largest score within the score distribution of each school. After achieving normality in the distributions, test scores were standardized within each school.

3.2. Procedure

The participating teachers were provided with written instruction—directions on the questionnaire to be read to the class, a reminder that students not spend too much time on each item and answer all items, and the approximate time required to complete the questionnaire. Teachers and students were assured of confidentiality. About a month after the data collection, students took final examinations.

3.3. Grouping procedure

To investigate homework SR reported by different levels of achievers in mathematics, participants were grouped into low-, medium-, and high-achieving groups within each grade. Students

Table 1
Means and standard deviations of homework self-regulation scores by mathematics achievement groups, grade, and gender.

		Grade 7						Grade 11						Total			
		Low ($n=78$)		Med ($n=82$)		High ($n=80$)		Low ($n=99$)		Med ($n=97$)		High ($n=98$)		G7 ($n=240$)		G11 ($n=294$)	
		M (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*	*M* (SD)	*n*
Utility value	M	2.84 (.67)	42	3.05 (.49)	38	3.07 (.66)	44	2.74 (.51)	26	2.70 (.57)	35	2.65 (.64)	54	2.98 (.62)	124	2.68 (.59)	115
	F	2.91 (.57)	36	3.19 (.56)	44	3.30 (.52)	36	2.73 (.49)	73	2.89 (.52)	62	2.78 (.50)	44	3.14 (.57)	116	2.80 (.51)	179
	T	2.87 (.62)	78	3.13 (.53)	82	3.17 (.61)	80	2.73 (.50)	99	2.82 (.54)	97	2.71 (.58)	98	3.06 (.60)	240	2.75 (.54)	294
Intrinsic value	M	2.63 (.52)	42	2.61 (.55)	38	2.66 (.66)	44	2.31 (.47)	26	2.11 (.42)	35	2.19 (.59)	54	2.64 (.58)	124	2.19 (.52)	115
	F	2.60 (.53)	36	2.81 (.52)	44	2.75 (.40)	36	2.18 (.40)	73	2.41 (.51)	62	2.24 (.54)	44	2.72 (.49)	116	2.27 (.49)	179
	T	2.62 (.52)	78	2.72 (.54)	82	2.70 (.56)	80	2.21 (.42)	99	2.30 (.50)	97	2.21 (.57)	98	2.68 (.54)	240	2.24 (.50)	294
Effort	M	2.77 (.55)	42	3.05 (.48)	38	3.06 (.58)	44	2.92 (.41)	26	2.60 (.61)	35	2.73 (.42)	54	2.96 (.55)	124	2.73 (.49)	115
	F	2.73 (.37)	36	3.11 (.47)	44	3.18 (.45)	36	2.79 (.55)	73	2.91 (.41)	62	2.83 (.43)	44	3.01 (.47)	116	2.84 (.48)	179
	T	2.75 (.47)	78	3.08 (.47)	82	3.11 (.53)	80	2.82 (.51)	99	2.80 (.51)	97	2.78 (.43)	98	2.99 (.52)	240	2.80 (.49)	294
Persistence	M	2.73 (.56)	42	2.96 (.52)	38	3.05 (.61)	44	2.60 (.52)	26	2.51 (.58)	35	2.65 (.52)	54	2.91 (.58)	124	2.60 (.54)	115
	F	2.71 (.50)	36	3.09 (.41)	44	3.01 (.56)	36	2.43 (.47)	73	2.63 (.42)	62	2.56 (.48)	44	2.95 (.51)	116	2.53 (.46)	179
	T	2.72 (.53)	78	3.03 (.46)	82	3.03 (.59)	80	2.47 (.49)	99	2.59 (.49)	97	2.61 (.50)	98	2.93 (.55)	240	2.56 (.49)	294
Plan	M	2.64 (.58)	42	2.77 (.55)	38	2.85 (.51)	44	2.62 (.57)	26	2.65 (.57)	35	2.59 (.64)	54	2.75 (.55)	124	2.61 (.60)	115
	F	2.51 (.45)	36	2.80 (.67)	44	2.99 (.61)	36	2.55 (.57)	73	2.62 (.56)	62	2.61 (.58)	44	2.77 (.61)	116	2.59 (.57)	179
	T	2.58 (.52)	78	2.78 (.61)	82	2.91 (.56)	80	2.57 (.57)	99	2.63 (.56)	97	2.60 (.61)	98	2.76 (.58)	240	2.60 (.58)	294
Self-check	M	2.42 (.66)	42	2.72 (.61)	38	2.61 (.65)	44	2.50 (.59)	26	2.33 (.62)	35	2.55 (.65)	54	2.58 (.65)	124	2.47 (.63)	115
	F	2.44 (.67)	36	2.45 (.59)	44	2.63 (.55)	36	2.38 (.51)	73	2.31 (.51)	62	2.44 (.58)	44	2.50 (.61)	116	2.37 (.53)	179
	T	2.43 (.66)	78	2.57 (.61)	82	2.62 (.60)	80	2.41 (.53)	99	2.31 (.55)	97	2.50 (.62)	98	2.54 (.63)	240	2.41 (.57)	294

Note. $N=534$ with Math achievement; Male = 239; female = 295; Grade 7 = 240; Grade 11 = 294. *T* stands for Total.

with scores in the bottom quarter (i.e., the lowest to 25th percentile) of the mathematics final examination were assigned to the low-achieving group; students with scores in the middle 25% (i.e., 37.5th to 62.5th percentile) to the medium-achieving group; and students with scores in the top quarter (i.e., 75th percentile to the highest score) to the high-achieving group. There were 78 low, 82 medium, and 80 high achievers in Grade 7, and 99, 97, and 98, respectively, in Grade 11, with a total sample size of 534. Table 1 presents sample sizes for achievement groups and gender for each grade.

3.4. Data analysis

To examine research questions, a multivariate approach to repeated measures analysis of variance (profile analysis) was performed with one within-subject factor (homework self-regulation; 6 indicators) and three between-subjects factors (grade, gender, and achievement group). For multivariate results, the Wilks' lambda criterion was applied. When interactions were significant, simple effects were tested, followed by simple contrasts when warranted. Otherwise, main effects were tested followed by multiple-comparison tests using conservative significance levels for multiple testing. Assumptions were met.

4. Results

The means and standard deviations of six homework self-regulation (SR) scores were presented by grade, gender, and achievement groups in Table 1. In general, the SR scores were lower in Grade 11, and achievement-group differences seemed apparent in Grade 7 but not in Grade 11 (see below for significance tests). Correlations among six SR measures ranged from .29 to .64 in Grade 7 and .19 to .53 in Grade 11. Except for one correlation, seventh graders' coefficients were higher than those of eleventh graders, with ten of the 15 correlation pairs showing statistically significant differences across grades, $ps<.05$ (see Table 2).

4.1. Homework self-regulation: Difference among six component scores (Research question 1)

The main effect of homework SR measures was statistically and substantially significant, $F(5,518)=119.50$, $p<.0005$, $\eta^2=.54$. Pairwise comparisons with Bonferroni adjustments indicated that all pairs were significantly different, $ps<.0005$, except for one pair (utility value and effort). *Utility value* ($M=2.89$; SD = .59) and *effort* ($M=2.88$; SD = .51) scores were the highest, followed by *persistence* ($M=2.72$; SD = .55), *planning* ($M=2.67$; SD = .58), *self-checking* ($M=2.47$; SD = .60), *and intrinsic value* ($M=2.43$; SD = .56).

4.2. Moderating effects of grade, gender, or achievement-group on homework self-regulation (Research question 2)

4.2.1. Grade

The interaction between homework SR and grade was statistically significant, $F(5,518)=9.31$, $p<.0005$, $\eta^2=.08$, a medium effect size. Within each grade (simple effects), the six homework SR scores were significantly different, $ps<.0005$, with η^2 ranging from.56 to.60. Table 3 presents mean orders and pairwise significance tests of the six homework SR scores for each grade (simple contrasts). *Utility value* and *effort* scores were the highest, followed by *planning* and *persistence*. *Intrinsic value* and *self-checking* scores were the lowest.

Grade differences in each of the six SR measures revealed that eleventh graders' scores were consistently lower than seventh graders', $p=.005$ to $p<.0005$. Fig. 1 presents homework SR scores for each grade.

4.2.2. Gender

The interaction between homework SR measures and gender was statistically significant, $F(5,518)=3.24$, $p=.007$. However, due to the small effect size, $\eta^2=.03$, we also tested gender main effect (see next

Table 2
Variable correlations for Grade 7 (upper triangle) and Grade 11 (lower triangle) and internal consistency estimates (alpha).

	1	2	3	4	5	6	α (7th)
1. Utility value	–	.59[a]	.60[b]	.55[c]	.40[d]	.43[e]	.81
2. Intrinsic value	.48[a]	–	.43	.56[f]	.35[g]	.29	.68
3. Effort	.43[b]	.33	–	.64[h]	.48[i]	.43	.60
4. Persistence	.36[c]	.41[f]	.53[h]	–	.47[j]	.44	.70
5. Planning	.21[d]	.19[g]	.27[i]	.29[j]	–	.44	.55
6. Self-check	.31[e]	.24	.36	.35	.51	–	.69
α (11th)	.78	.67	.60	.61	.57	.66	–

Note. All correlation coefficients are statistically significant, $ps<.01$. The pairs with the same superscripts ([a] through [j]) are correlations of the same pair of variables that are significantly different between the two grade levels, $ps<.05$. Grade 7: $n=330$; Grade 11: $n=407$.

Table 3
Orders of mean homework self-regulation scores for grade and gender.

Grade 7	Grade 11	Male	Female
Utility value[a]	Effort[d]	Effort[a]	Utility value[e]
Effort[a,b]	Utility value[d]	Utility value[a,b]	Effort[e]
Persistence[b]	Planning[d]	Persistence[b,c]	Persistence[f]
Planning[c]	Persistence[d]	Planning[c]	Planning[f]
Intrinsic value[c]	Self-checking	Self-checking[d]	Intrinsic value[g]
Self-checking	Intrinsic value	Intrinsic value[d]	Self-checking[g]

Note. Means and standard deviations can be found in Table 1; $N = 534$; Grade 7 = 240; Grade 11 = 294.
[a,b,c,d,e,f,g]Means of the homework self-regulation constructs with the same superscript letter-pairs were not significantly different. Bonferroni adjustments were made for multiple comparisons. All $ps < .005$, except in Grade 7, between *intrinsic value* and *self-checking*, $p = .037$, and in male students, between *effort* and *persistence*, $p = .024$.

section). Within each gender, the six homework SR scores were statistically and substantially different, $ps < .0005$, η^2 ranging from .48 to .61. Table 3 presents mean orders and pairwise significance tests of homework SR scores for males and females. Simple contrasts of SR scores in each gender indicated that male and female students rated *utility value* and *effort* the highest, followed by *planning* and *persistence*. *Intrinsic value* and *self-checking* scores were the lowest. Fig. 2 presents male and female homework SR scores. Notice that gender moderation of the SR measures is trivial (a small effect).

4.2.3. Achievement level

Achievement had no significant moderating effect on homework SR scores, $p = .07$. No other higher order interaction effects were found in this study.

4.3. Grade, gender, or achievement-level effects on homework self-regulation (Research question 3)

The main effect of grade was statistically significant, $F(1,522) = 5.61$, $p < .0005$, partial $\eta^2 = .10$, as well as the achievement-group main effect, $F(2,522) = 5.61$, $p = .004$, partial $\eta^2 = .02$. Pairwise comparisons among achievement groups revealed that homework SR scores were significantly different between low ($M = 2.61$; SE = .03) and medium achievers ($M = 2.72$; SE = .03), $p = .036$, and between low and high achievers ($M = 2.75$; SE = .03), $p = .004$, but not between medium and high achievers, which is attributed to the small size of main effect. The gender main effect was not statistically significant, $p = .40$.

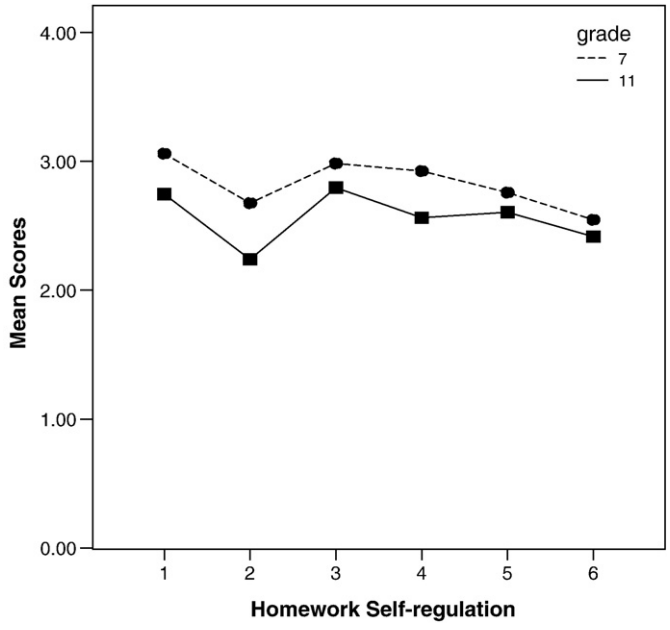

Fig. 1. Homework self-regulation scores by grade. 1 = utility value; 2 = intrinsic value; 3 = effort; 4 = persistence; 5 = planning; 6 = self-checking.

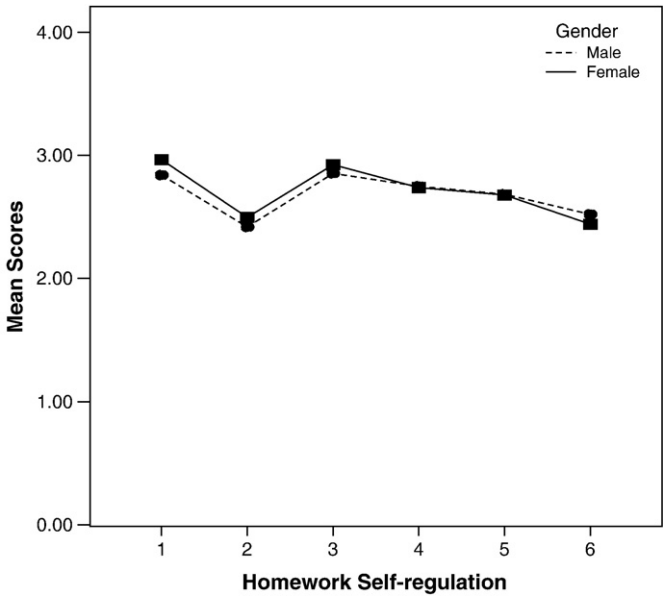

Fig. 2. Homework self-regulation scores by gender. 1 = utility value; 2 = intrinsic value; 3 = effort; 4 = persistence; 5 = planning; 6 = self-checking.

4.4. Interaction effects among group variables on homework self-regulation (Research question 4)

A statistically significant interaction effect was found between grade and achievement group, $F(2,522) = 5.42$, $p = .005$, partial $\eta^2 = .02$. Simple effects of achievement-group differences for each grade revealed that in Grade 11 homework SR scores of three achievement groups were not different. In Grade 7, the three groups were significantly different in homework self-regulation scores, $p < .0005$, partial $\eta^2 = .07$, with high achievers scoring the highest overall homework SR ($M = 2.93$; SE = .05), followed by medium ($M = 2.89$; SE = .05) and low achievers ($M = 2.66$; SE = .05). The difference between the medium- and high-achieving groups was not statistically significant. Grade differences in each achievement level indicated that in medium- and high-achievement levels, the two grades were statistically and practically different in overall homework SR scores, $ps < .0005$, with partial $\eta^2 = .15$ and partial $\eta^2 = .16$. Within low achievers, grade difference was not found, $p = .03$.

The interactions between gender and achievement groups, $p = .17$, and among the three group variables, $p = .50$, were not statistically significant.

5. Discussion

Self-regulated learning has been studied extensively in the recent past. However, how students perceive their self-regulated behavior applied to homework has rarely been examined. In the current study, we extended the existing research by examining a number of components of self-regulation applied to homework within the context of Chinese education system. Although the first research question regards differences among six homework self-regulation constructs, we present the discussion of group differences and group moderating effects first followed by the discussion of the differences in six component scores of homework self-regulation. This order of presentation reduces redundancies in discussing interaction effects.

5.1. Grade differences

Older Chinese students perceived homework as less useful, enjoyed doing homework less, expended less effort, persisted less, and engaged in planning and self-checking less than did younger students. These findings replicate previous studies with students from Western culture that found a similar pattern of declines in valuing school work (Wigfield et al., 1997) and in effort and persistence in homework completion (Hong & Milgram, 2000). Previous studies on homework indicate that older students found homework not interesting or meaningless more so than younger students (Cooper et al., 2000). Knowledge of metacognitive strategies may improve with age at the early childhood or elementary level (Warton, 1997), but students in this study reported that they used such strategies less in high school than in middle school.

Hong et al. (2000) observed that both Chinese and U.S. students, especially older students, favored unstructured over structured homework assignments. Practice-type homework (structured) has been used for the purpose of reinforcing mastery of skills or memorization of facts. Chinese students receive a variety of drill-and-practice type assignments and more students disliked such homework than liked. The declines in the valuing of homework as well as other schoolwork among adolescents are viewed by some as a reflection of psychological changes taking place around this transitional time (Blyth, Simmons, & Carlton-Ford, 1983; Rosenberg, 1986). Others have suggested that the negative changes may be explained by structural changes in the school environment (Watt, 2004). High schools in China, as in the U.S. and Australia (Watt, 2004), provide structures that are far different from elementary or middle schools in class organization and instructional delivery. These environmental changes may be a source for general declines that are present across cultures.

5.2. Achievement-level differences

In seventh grade, high achievers reported their homework self-regulation level higher than low achievers. In eleventh grade, however, the overall reported homework self-regulation did not differ among the three levels of achievers. These differences in overall homework self-regulation, coupled with low scores shown among all levels of achievers in older students, are troubling. High achievers in Western schools, in general, value their schoolwork more (Lepper et al., 2005), put forth more effort and are more persistent (Obach, 2003), as compared to low achievers. Whether the no-difference among different achievement levels found in older Chinese students indicates their apathy toward schoolwork in general or whether this phenomenon applies only to “homework” situations is to be further investigated.

The achievement-level differences in the reported metacognitive strategy use in eleventh graders were not significant. This finding is consistent with studies conducted with Chinese students in Hong Kong. Whereas high and low achievers in high school were not different in their use of self-regulated learning strategies (Rao et al., 2000), the difference was significant in the middle-grade Chinese students (Salili & Lai, 2003). The grade and achievement-level interaction found in this study still needs to be further understood not only through the lens of cultural impact but also the developmental impact that seems to be ubiquitous across cultures.

5.3. Gender difference

Gender difference was not evident in homework self-regulation, a negligible size of moderating effect notwithstanding. Previous studies on gender difference in self-regulation are not consistent. Whereas male students valued mathematics more than females in some studies (Watt, 2004), others found females valuing mathematics more than males (Jacobs et al., 2002). Female students reported expending more effort or being more persistent (Hong & Acqui, 2004) and using more planning or monitoring strategy (Martin, 2004) than male students.

The nonsignificant gender difference in homework self-regulation and the similarity of rating patterns on the six constructs across gender in the current Chinese students are rather striking. Literature on gender difference in achievement scores among Chinese students shows that the pattern of gender effects has been changing. Whereas boys scored higher than girls in science in the late 1980s (Wang & Staver, 1997), in a recent *Trends in International Mathematics and Science Study* (Beaton et al., 2000), male and female students scored similarly, with females scoring slightly higher in mathematics. Byrnes, Hong, and Xing (1997) also found that while a large gender difference in mathematics was evident in American students, no such difference was indicated in Chinese students. This trend may reflect changes occurring in modern-day China in terms of its people's perception of gender equity in education. The current findings of gender similarity in homework self-regulation may reflect the trend shown in academic achievement.

5.4. Differences among six homework self-regulation constructs

When the six homework self-regulation constructs were compared for their mean differences, Chinese students consistently rated utility value of homework and effort expenditure for homework completion the highest, followed by persistence and planning. The intrinsic value of homework was the lowest, along with self-checking. That is, students did not like doing homework as much as they thought it useful, regardless of grade or gender. When the grade level was analyzed separately, the negative attitude toward homework was more prominent in older students.

The apparent contrast in Chinese students' views on utility and intrinsic value deserves an elaboration. Chinese families and society value education highly (Chao, 1996). As most Chinese view education and a diploma as a chance for social advancement, it is important for students to receive high grades in school (Lin & Chen, 1995). As such, homework has been valued by schools and parents as a utility for high achievement in school. The high rating on utility value by Chinese students is thus understandable, as their beliefs and perceptions develop in the contexts of their home, school, and the broader culture (Rogoff, 1990).

The intrinsic value of homework was lower than utility value, especially in older students. It seems that the social value of education, homework utility to be specific, does not translate into intrinsic valuing of homework. Chinese students receive a large amount of homework. The cumulative impact of the large amount of work could be that students gradually develop distaste for this educational practice. Increasing homework amount does not likely increase intrinsic value, especially when the quality of homework assignments is poor (Cooper et al., 1998). One might ponder, however, whether increasing students' intrinsic valuing of homework is as essential when students hold utility value and work hard to complete assignments. Many human activities (e.g., medical procedures) are not necessarily enjoyable but have utility value for increasing the quality of life. This is an area that warrants more research and discussion.

Both seventh and eleventh graders in this study reported expending effort more than using metacognitive strategies for homework. Self-checking homework progress was especially low as compared to planning. As effort is strongly emphasized in Chinese culture (Hau, 1996), the high self-rating of effort is not surprising. Chinese students might plan, put forth effort in homework, and complete it dutifully whether they like it or not. Yet, students might have not viewed self-checking as necessary because they strive to complete homework anyway or they might not have realized that they have been monitoring homework progress. As the positive

relationship between strategy use and achievement has been demonstrated in numerous studies (Kitsantas, 2002) and with the finding of seventh-grade high achievers reporting a higher level of metacognitive strategy use in this study, strategy instruction may be beneficial to Chinese students.

5.5. Limitations

The alpha coefficients of the six homework self-regulation variables were not consistently high, especially *planning*. It is also possible that students interpreted the items differently due to having little learning experience about metacognitive strategy use. This reason as well as the small number of items that measured planning might have caused the low reliability in planning. However, reliability as low as .49 may not be a problem when the items cover the content meaningfully (Schmitt, 1996).

Although the self-report approach is relevant for understanding participants' thoughts and perceived behaviors (their reality), studies with more rigorous observation approaches are desired along with analyses of self-reports. Readers are reminded that the current study involved Chinese students from a large metropolitan area. Thus, the findings may not represent students from the rural areas and small cities of China.

6. Conclusions

In China, reform efforts directed at the National Entrance Examination for higher education are in place to reduce the "heavy burden on students" and help them "grow into a new generation with overall development in intelligence, morale…." (China Ministry of Education, 2006). As China seeks to hold its competitive edge in the emerging global economy, it would not be surprising to see continued efforts to develop an education system that meets the challenges of modernization. The rapid changes in all aspects of the lives of Chinese people in recent years challenge researchers to pinpoint what cultural implications can be made in studies with Chinese children.

Homework experiences have been shown to be positively related to students' use of learning strategies as well as to students' responsibility for academic outcomes (Zimmerman & Kitsantas, 2005). However, homework will not likely fulfill its purpose of helping students in developing skills and responsibility and extending learning, as long as students perceive it negatively. Furthermore, understanding and addressing high school students' low reported scores in homework valuing, motivation, and strategy use is important as it has implications for learning in school and beyond formal schooling.

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