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AUTHOR Hong, Eunsook; Lee, Kit-hung
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ABSTRACT

This study compared preferred homework styles of Chinese students who were characterized by: (1) high versus low self-perceived homework achievement and attitude; (2) high versus low teacher-rated homework completion and quality; (3) high versus low academic achievement in mathematics. Gender differences in homework styles were also examined. Participants were 329 fifth graders (172 boys and 157 girls) and 244 seventh graders (130 boys and 114 girls). More distinguishing homework style elements were found with the self-perceived homework achievement and attitude levels than in the teacher-rated achievement (homework completion and quality and final examination scores). Neither gender differences nor gender-achievement interaction effects were indicated in the current samples. As expected, the motivational elements distinguished the high/low levels of all types of achievement and attitude toward homework. While high teacher-rated achievement was more closely associated with high scores of the teacher-motivated element, the self-perception of work accomplishment at home was more positive in those students who were highly motivated by parents as well as teachers. In general, no significant differences were indicated in the perceptual sensitivity elements (auditory, visual, tactile, kinesthetic) between high- and low-achieving students, while some group differences were found on the physical elements (intake, mobility) in some of the achievement and attitude measures. A number of environmental and organizational elements also distinguished the high from low achievers. The importance of teacher and parent roles in student achievement is discussed. (Contains 2 tables and 32 references.) (Author/SLD)

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in High- versus Low-achieving Chinese Students

Eunsook Hong and Kit-hung Lee

University of Nevada, Las Vegas

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Correspondence concerning this article should be addressed to Eunsook Hong, Educational Psychology, University of Nevada, Box 453003, Las Vegas, NV 89154-3003.

Ehong@nevada.edu.

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Abstract

The study compared preferred homework styles of Chinese students who were characterized by (a) high vs. low self-perceived homework achievement and attitude, (b) high vs. low teacher-rated homework completion and quality, and (c) high vs. low academic achievement in mathematics, and examined gender differences of homework styles in these students. The participants were 329 fifth graders (172 boys and 157 girls) and 244 seventh graders (130 boys and 114 girls). More distinguishing homework style elements were found with the self-perceived homework achievement and attitude levels than in the teacher-rated achievement (homework completion and quality and final exam scores) levels. Neither gender differences nor gender-achievement interaction effects were indicated in the current samples. As expected, the motivational elements distinguished the high/low levels of all types of achievement and attitude toward homework. While high teacher-rated achievement was more closely associated with high scores of the teacher-motivated element, the self-perception of work accomplishment at home was more positive in those students who were highly motivated by parents as well as teachers. In general, no significant differences were indicated in the perceptual sensitivity elements (auditory, visual, tactile, kinesthetic) between high- and low-achieving students, while some group differences were found on the physical elements (intake, mobility) in some of the achievement and attitude measures. A number of environmental and organizational elements also distinguished the high from low achievers. The importance of the teacher and parent role in student achievement was discussed.

Preferred Homework Style and Homework Environment in High- versus Low-achieving Chinese Students

Homework is a frequently used teaching strategy in schools. Books and articles of advice on helping children with homework have appeared (e.g., Bursuck, 1995; Epstein, 1998; Hoover-Dempsey, Bassler, & Burow, 1995; Radencich & Schumm, 1997; Rosemond, 1990), and a number of popular magazines such as "The Economist," "Parents Magazine," and "Times Educational Supplement" often deal with the homework issue. However, both theoretical and empirical articles on homework share varying views ranging from strong criticism of the homework use to claims that homework is a vital requirement of schooling and that proper use of homework can help increase academic achievement (e.g., Cool & Keith, 1991; Cooper, 1998; Corno, 1996; Gill & Scholssman, 1996). The inconsistent opinions and research findings may be due to the inadequate distinction or inclusion of the homework factors affecting academic achievement and attitude. While most studies of homework effects have focused on the characteristics of the homework itself (e.g., type, quality, amount, and feedback approach), individual differences of the persons doing the homework (e.g., individual preferences of conditions of home environment) received relatively little attention. The current study brings learners into focus by examining their preferences in the way they do homework and the effects of various preferred styles on academic achievement and homework attitude.

Individual differences in in-school learning style and positive learning outcomes effected by accommodating the learning environment to individual learning style preferences have been well documented (Boulmetis & Sabula, 1996; Callan, 1996; Caudill, 1998; Dunn, Griggs, Olson, Beasley, & Gorman, 1995; Hodgins & Wooliscroft, 1997; Madrazo, 1998; Renzulli & Reis, 1998). As every student has a characteristic school learning style, each student has a characteristic style for learning outside of school. Studies on the out-of-school learning style, i.e., homework style, have indicated that learning style in school and out of school are related yet empirically distinguishable (Hong, Milgram, & Perkins, 1995). In addition, students' preferred learning style and actual learning style were similar, but they were again empirically distinguishable (Hong & Milgram, in press); that is, students who had certain preferences for

doing their homework might or might not have done their homework according to their preferences.

Different patterns of homework style were indicated between high and low homework achievers and between children with positive and negative attitudes toward homework (Hong et al., 1995). In the study of homework style differences among U.S. students with different levels of academic and homework achievement, it was found that motivation distinguished achievement levels of all types (perceived and teacher-rated homework achievement and academic achievement), that no differences were indicated in perceptual preferences (auditory, visual, tactile, kinesthetic) between low and high achievers, and that students in the high homework achievement group were more parent-motivated than were their low-achieving peers, indicating the importance of parental role in the home study environment (Hong, 1998).

The present investigation extends previous studies by examining homework style differences among Chinese students with different achievement levels and between gender of these students. Cultural differences have been found in in-school learning styles (e.g., Claxton, 1990; Griggs & Dunn, 1996; Hong & Suh, 1995; Milgram, Dunn, & Price, 1993; Smith, 1992). Different patterns of homework style have also been indicated among individuals from different cultures (Hong & Milgram, in press; Hong, et al., 1995). For example, although there were some similarities in homework styles of the U.S. and Korean students, there were a substantial number of homework style elements that clearly distinguished children from the two cultures. Children in grades five, six, and seven in the U.S. differed from their Korean age peers in that they preferred to have some sort of background sounds, to eat or drink, and to move about when they do their homework. They reported themselves as being more parent- and teacher-motivated in doing their homework and expressed the need for the presence of authority figures to a greater degree than did Korean students. Korean students reported stronger preferences to do their homework in the same place in the house all the time, in a well-lit room, and with the formal design of furniture such as a desk and chair.

The investigation on the effects of homework style on achievement with Chinese students in Hong Kong is of interest because of the high academic achievement reported in these children in the international studies (TIMSS International Study Center, 1998). Compared to students in the U.S., Chinese students were assigned more homework, spent more time on homework, and had more positive attitudes about homework (Chen & Stevenson, 1989). The present study on the Chinese students' homework preferences and their relationships with achievement would be a valuable resource for cultural comparisons of homework style findings from previous and future studies. Specifically, the purposes of the study were to compare preferred homework styles of Chinese students who were characterized by (a) high vs. low self-perceived homework achievement and attitude, (b) high vs. low teacher-rated homework completion and quality, and (c) high vs. low academic achievement in mathematics, and to determine gender differences of homework styles in these students.

Method

Participants

The participants were 329 Chinese fifth graders (172 boys and 157 girls) and 244 seventh graders (130 boys and 114 girls). The students were from an urban school, which housed kindergarten through high school in Hong Kong, where all of the students are from a Chinese ethnic background. Participants largely consisted of middle to upper middle class students.

All fifth- and seventh-grade students in this school who were present on the day the investigation was conducted participated. Because there were some students with random missing data (i.e., a page or some items were skipped randomly), only those students who had completed questionnaires were included in the sample of 329 fifth and 244 seventh graders.

Measures

Students' homework style. The Homework Preference Questionnaire (HPQ) (Milgram & Hong, 1996) was employed to measure students' preferred homework style. The HPQ provided a comprehensive assessment of the conditions under which each participant preferred to learn at home (i.e., preferred homework style). It consisted of 80 items that were rated on a five-point scale indicating degree of agreement. The questionnaire yielded 20

scores that corresponded to the 20 postulated elements of homework style. Each of the 20 scores consisted of 4 items. For 14 scores, high scores indicated high preferences (motivation, persistence, responsibility, parent-motivate, teacher-motivated, structure, set-order, auditory, visual, tactile, kinesthetic, intake, mobility, authority figures). Six scores of homework style were scored on a bipolar continuum from low to high, with high scores indicating preference for the second pole cited (silence/sound, dim/bright light, cool/warm temperature, informal/formal design, change place/same place, alone/peers). The scale is categorized into five areas: (1) environmental (sound, light, temperature, design); (2) structural/organizational (structure, set-order, set-place); (3) motivational (self-motivated, persistence, responsibility, parent-motivated, teacher-motivated); (4) perceptual/physical sensitivity (auditory, visual, tactile, kinesthetic, intake, mobility); and (5) individual/social (alone/peers, authority figure). Table 1 presents the internal consistency estimates (Cronbach alpha) computed separately for fifth and seventh graders. The median internal consistency was .73 and .77 for fifth and seventh grade, respectively.

Perceived homework behavior. Four items that assessed participants' self-perceived homework achievement and four items for perceived homework attitude were added to the HPQ. The eight items were interspersed in the HPQ to avoid any response set problem. Participants were rated on a five-point scale indicating degree of agreement. An example of the homework achievement items is: "If grades were given for homework, I would get a high grade." The internal consistency of the perceived homework achievement was .60 and .71 in the fifth- and seventh-grade sample, respectively. An example of the homework attitude items is: "What I learn from doing my homework helps me in school." The internal consistency of the perceived homework attitude was .79 in both grades.

Teacher-rated homework achievement. The participating classroom teachers rated their students' homework completion and homework quality in the mathematics subject matter. Due to the varying recording systems they used in rating homework achievement, teachers were instructed to assign scores from 1 to 10, based on their records on homework completion and quality.

Academic achievement. Scores on the mathematics final examination were the measure of academic achievement in this study. The participating fifth-grade teachers provided the scores of their own class students. For seventh graders, teachers who taught mathematics provided the scores of the participating students. The tests were common to all students in each grade, and the possible range of the examination scores were from 0 to 100.

Procedure

The HPQ was group-administered to students in their school classrooms with no time limits. The questionnaires were translated into Chinese by the junior author, who is fluent in both Chinese and English and had 24 years of teaching experience in elementary and secondary schools. The initial translation was modified by both authors; the modification consisted of cultural considerations in the use of certain terms in the items. A back-translation was performed by another Chinese-English bilingual who had been a kindergarten and elementary school teacher for 2 years in Hong Kong and 12 years in Canada. The back-translations that were not considered acceptable were modified again until all the items were considered acceptable.

Results

Multivariate analyses of variance (MANOVAs) were conducted on the 20 homework style elements. The independent variables were two levels (high vs. low) of achievement scores and gender. The assignment to the high or low achievement level was based on two splitting points of approximately 25th percentile and 75th percentile. To obtain a clear distinction between high and low achievers, those who fell between the first and third quartiles were excluded from the analysis. Each type of achievement, i.e., self-perceived homework achievement and attitude, teacher-rated math homework achievement (completion and quality), academic achievement (math final exam score), was examined separately. Due to the availability of the homework and exam scores and the approximate quartile values used for the group assignment, the sample sizes varied slightly for different analyses. All reported results of MANOVAs in this study were based on the Wilks' criterion.

Results from MANOVAs indicated neither interaction effects between gender and level of achievement nor gender main effects in all three types of achievement. However, statistically significant differences were indicated between the low- and high-level groups in perceived homework achievement and attitude, $p_s < .0005$; between the two levels of teacher-rated homework completion and quality scores in mathematics, $p_s < .05$ to $.0005$, and of math final exam scores, $p < .05$ (fifth grade) and $p < .01$ (seventh grade). An exception to the forgoing findings was indicated in the fifth-grade homework completion scores, which did not reach the significant level. The effect size (η^2) of the group differences in perceived homework achievement were $\eta^2 = .54$ (fifth) and $\eta^2 = .65$ (seventh); in perceived homework attitude were $\eta^2 = .55$ (fifth) and $\eta^2 = .59$ (seventh); in teacher-rated homework completion were $\eta^2 = .12$ (fifth) and $\eta^2 = .38$ (seventh); in homework quality were $\eta^2 = .17$ (fifth) and $\eta^2 = .29$ (seventh); and in math achievement were $\eta^2 = .23$ (fifth) and $\eta^2 = .30$ (seventh).

Univariate analyses of variance followed each MANOVA, with appropriate adjustments of alpha levels due to assessing the large number comparisons. In the following section, the findings from univariate tests were reported. Univariate findings with the probability level less than $.005$ was considered statistically significant. Although findings with probability levels between $.005$ and $.05$ were also reported for future comparisons, they should be interpreted with caution.

Self-Perceived Homework Behavior

Perceived homework achievement. Fourteen of the 20 homework style elements distinguished the two levels of self-perceived homework achievement in the fifth-grade sample. All environmental elements except temperature and all organizational and motivational elements were significantly different between the two groups of high and low achievers, $p_s < .001$. The two physical elements (intake and mobility) distinguished the two groups, $p_s < .0005$, while none of the perceptual elements did (except for the tactile element significant at the $.05$ level). One of the two individual/social elements (alone/peers) also differentiated the two groups, $p < .005$.

Mean scores of the two groups indicated that Chinese students who perceived their homework achievement high reported that they prefer a quiet and bright environment, formal

design (desk and chair), structured homework, organizing homework in a certain order, and the same place when they do homework, and that they need neither to eat or drink nor to move about, when compared to their low-achieving peers. The self-perceived high-achievers were also more self-motivated, persistent, responsible, parent- and teacher-motivated, and liked to study alone than did low-achievers.

The findings from the seventh-grade sample were very similar, except for the tactile element significant at the .005 level; high-achievers preferred hands-on homework compared to low-achievers. Means and standard deviations of the homework style elements for the low- and high-achieving groups are presented in Table 1. Star sign (*) denotes the significance level for the fifth grade, and the pound sign (#) for the seven grade.

 Insert Table 1 about here

Perceived homework attitude. Findings on homework attitude in the fifth-grade sample were similar to those reported above, with two exceptions; the light and tactile elements did not show differences between the two groups. Similar findings were obtained also with the seventh-grade sample, with a few exceptions in structure, tactile, and alone/peers that were no longer significantly different between the students with high and low levels of homework attitude scores. Thus, in general, students with positive attitudes toward homework also reported their style preferences that were similar to those reported by the students who perceived their homework achievement high. Worth noting in this analysis is that in both grades all perceptual sensitivity elements (auditory, visual, tactile, kinesthetic) were not significantly different between the two homework attitude groups, while the two physical sensitive elements (intake, mobility) were. The scores of sociological elements (alone/peers, authority figure present) were not different in the two groups, except for one occasion; fifth-grade students with a positive attitude toward homework preferred to do their homework alone as compared to their peers with less positive attitudes. However, the sociological elements in general did not make differences in students' homework attitudes.

Teacher-Rated Homework Achievement

Two teacher-rated homework scores--homework completion and quality--in mathematics were used separately in the grouping, and homework preference scores were compared between the two groups.

Homework completion. As indicated earlier in the MANOVA findings, the high and low teacher-rated homework completion groups of fifth graders were not different on the overall homework style scores. An inspection of the completion scores indicated that the scores in the high-completion group were all 10s, and most of the scores in the low-completion group were 7s and a few other lower scores. This invariability in the completion scores, although these students might have had various levels of mathematical understanding, might have caused the low discriminating power (i.e., the "completion" score difference of 10 and 7 may not be sufficient enough for discriminating style differences). With the nonsignificant multivariate findings, only one element was significantly different between the two groups in the univariate analyses at the .005 level; students in the high-completion group were more self-motivated than were their low-completion counterparts. The two groups were also different in the design, persistence, responsibility, and teacher-motivated elements, but only at the .01 or .05 level of significance (see Table 2).

In seventh grade, students with higher completion scores reported higher levels in all motivational elements (motivation, persistence, responsibility, teacher-motivated, $p < .0005$, and parent-motivated, $p < .01$), as compared to their low-achieving peers. Two distinguishing elements at the .05 level were light and intake preferences; students with high completion scores preferred more light, and those with low completion scores preferred to eat or drink while doing homework, when compared to their counterparts. The positive relationships between the homework completion scores and motivational-element scores became stronger in the seventh grade. It may be that with the difficulty of mathematics subject matter rising in the upper grade level, motivation to do homework well began to affect more on the performance of homework completion. The mean scores of the distinguishing homework style elements are presented in Table 2.

Homework Quality. In both fifth and seventh graders, the high and low homework quality groups were significantly different in the three motivational elements (self-motivated, persistence, responsibility) at the .005 levels, and another motivational element, teacher-motivated, at the .05 level. The two groups were not significantly different in the parent-motivated element. Fifth-grade students in the high homework quality group were more visual than were those in the low quality group, $p < .005$. Three additional elements were different between the two groups at the .05 level: Students in the high homework quality group preferred formal design of furniture and adult figures present when doing homework, while those in the low quality group preferred to eat or drink more than did their high-achieving counterparts (see Table 2).

 Insert Table 2 about here

Academic Achievement

Mathematics final exam scores were used for grouping the high- and low-achieving students. In fifth grade, one style element (responsibility) was significantly different between the two groups at the .0005 level and two elements (persistent and light) were at the .05 level. In seventh grade, however, four motivational elements (self-motivated, persistence, responsibility, teacher-motivated) were significantly different between the two groups at the .005 or .0005 level, while intake was at the .01 level. Table 2 includes the mean scores of these elements. Again, students in the high math achievement group showed higher motivational level, with seventh graders showing stronger relationships between motivation scores and math achievement than fifth graders. High math achievers also preferred more light (fifth) but less intake (seventh) than did low math achievers.

Discussion

Both similar and different patterns of preferred homework styles were reported by students in the high- and low-achieving groups. However, the different types of achievement measures (self-perceived versus teacher-rated achievement scores) revealed large differences in

the number of style elements that distinguished the high- and low-achieving groups. More distinguishing homework style elements were found with the self-perceived homework achievement and attitude levels than with the teacher-rated achievement levels. These results largely replicate the findings with U.S. seventh-grade students (Hong, 1998). This may indicate that students' self-perceived homework achievement and attitude reflect their preferred ways of doing homework more closely than do teacher-rated achievement measures and that teacher-rated achievement were to be explained by many factors other than homework style dealt in this study (e.g., ability, previous achievement level).

Neither gender differences nor gender-achievement interaction effects were indicated in this study with the Chinese fifth- and seventh-grade samples. Some gender effects were found in the in-school learning style studies (e.g., Girls tended to be more persistent and able to sit still than boys), although more similarities than differences in in-school learning styles were evident (Dunn, Gemake, Jalali, Zenhausern, Quinn, & Spiridakis, 1990; Yong & McIntyre, 1992). Gender differences were also indicated in a small number of homework style elements in the U.S. and Korean seventh-graders (Hong & Milgram, in press). For example, more females than males reported that they liked doing their homework in a brightly illuminated home environment and organized their assignments in a certain order while doing their homework. On the other hand, more males than females reported that they actually did their homework with adult figures present. The current findings of no gender differences in Chinese students in Hong Kong might suggest that there may be some cultural influences in gender differences. However, further studies with students from Chinese and other racial backgrounds are needed to ascertain the veritable nature of gender differences.

Not surprisingly, the motivational elements, especially persistence and responsibility, were significantly different between the two levels of all types of achievement and attitude toward homework: Students in the high-achieving group were more self-motivated, persistent, and responsible in doing their homework than were those in the low achievement group. Interestingly, while students with high level of self-perceived homework achievement and attitude were motivated by parents as well as teachers, that is, the self-perception of work at

home was positive in those students who were highly motivated by parents and teachers, high level of teacher-rated achievement (homework completion and quality and final exam scores) was associated with high teacher-motivated (with one exception in seventh grade where both teacher- and parent-motivated students scored high in homework completion).

These findings with Chinese students generally replicate the previous finding with U.S. students, where students in the high homework achievement group (both self-perceived and teacher-rated) were more parent- and teacher-motivated than did their low-achieving counterparts, while high academic achievers (high exam scores) were more teacher-motivated, but were not more parent-motivated, than were low academic achievers (Hong, 1998). The findings from the two studies together suggest the significant parental role in the home study environment and the significant teacher role in school achievement. However, that parents and teachers are both influential directly and indirectly in motivating students' homework behavior is evident, especially with the findings on the self-perceived homework achievement and teacher-rated homework scores where both parents and teachers seem to influence the motivation of work at home.

No perceptual sensitivity elements (auditory, visual, tactile, kinesthetic) distinguished the high- and low-achieving students of all achievement types, except for the two small effects (tactile with self-perceived homework achievement and visual with homework quality). The perceptual strength is indeed an individual preference of the way students study, and not one specific perceptual strength promote student achievement and attitude. Similar results were found in the U.S. sample, where none of the perceptual elements showed differences between high and low achievers (Hong, 1998). However, the physical elements, especially intake, were significantly different between the two levels in some types of achievement and attitude scores, although the significant findings were not consistent over the two grade levels in the teacher-rated achievement measures. Generally, low-achieving students preferred to eat or drink and to move about when they do homework, compared to their high-achieving peers, the tendency shown also in the U.S. sample (Hong, 1998).

In regard to the environmental elements, students who perceived their homework achievement level high preferred a quiet and well-lit environment and formal design of furniture (desk and chair) when doing their homework. Students with positive attitude toward homework also preferred a quiet and formal design, but did not have specific preferences toward lighting or temperature. Although there were some significant findings on light and design with teacher-rated achievement levels, the effects were too small and inconsistent over the two grades to interpret the findings properly.

Structural/organizational preferences (structure, set-order, set-place) were differentiated only by the self-perceived homework achievement and attitude levels, with high achievers preferring to work with the structured homework instructions, to organize the assignments in some order, and to use the same spot in the house. However, these elements did not make differences in the teacher-rated achievement.

The relationships between motivational-element scores and achievement (the homework completion and math exam scores) were stronger in older students. Although the proper explanations cannot be drawn out given the current data, it could be that the subject matter used in the study (math) may be a reason; due to the difficulty of the subject in the upper grade level, motivation to do their homework well might have made larger differences in the actual performance. Overall, however, similarities between the two age levels were more compelling than differences. More younger and older students need to be examined to further understand the developmental change.

In previous studies (Hong & Lee, 1999; Hong et al., 1995), students whose parents were cognizant of their preferred homework style perceived their own homework achievement and attitude positively. Although this relationship was also apparent in the analysis of school performance (exams), the effect sizes were smaller than those found with self-perceived measures, and the findings were inconsistent across different subject matters (Hong & Lee, 1999). Even with the intervention designed to increase family involvement, the intervention was not significantly related to student achievement on a test, even if it increased family involvement (Balli, Wedman, & Demo, 1997). These previous and current findings are not discouraging,

however. The school achievement is influenced by various factors, and it is not surprising that short interventions of family involvement would not show discernable effects on children's school achievement.

The homework style differences found in high and low achievers in this study, and the positive findings of increased family involvement and the positive association between parental awareness and achievement scores in other studies, suggest that students' preferred homework style as accommodated by students themselves and assisted by their parents would in the long run increase student achievement. The findings with self-perceived homework achievement and attitude that resulted in a large number of preferred homework style elements that distinguished high from low achievers are also promising in view that the use of preferred homework style would make differences in the home study situation with increasing positive perceptions of their own homework achievement, whose effects, when preferred styles are accommodated in the home environment, might be manifested in school achievement.

When the current and previous studies on homework style (Hong, 1998) were compared, a few country- or sample-specific distinguishing style elements surfaced; that is, some elements that were different between high- and low-achieving students in the Chinese sample were not so in the U.S. sample, and vice versa. For example, persistence and responsibility distinguished the two groups of teacher-rated achievement in the Chinese but not in the U.S. seventh grade sample. However, the consistency of the findings across the U.S. and Chinese samples are remarkable, suggesting the importance of understanding and application of homework style information in the home wherever the student is from.

Due to the nonexperimental nature of the current study where many uncontrolled variables influence student achievement, it was expected that the effect sizes would be relatively small. We reported the univariate findings with the .05 and .01 levels of significance with small effect sizes. Even if most of these findings tend to be consistent across the current and previous studies, the findings with the low probability level should be considered as tentative and interpreted with caution. The internal consistency estimates for a few style elements were low.

The findings associated with these elements also need to be interpreted with caution, and the study needs to be replicated using various samples.

The findings of out-of-school learning styles in this study add to the knowledge base our understanding of the patterns in preferred homework style and home environment of students in different achievement levels. However, even though it is important to understand the group differences in learning styles, individual differences in each student's preferences should not be overlooked in its application to various learning environments. For example, unlike the findings, some students might prefer to study at home with background noise or on the bed, and still be very high achievers. These individual preferences should be respected with careful parental observations whether the child's preferred style indeed distracts her from studying efficiently. To be able to assist the child in homework, parents should be informed of the homework style issue. It has been found that some parents are often unaware of their children's preferred way of studying at home (Hong & Lee, 1999; Hong et al., 1995). Although it may not be appropriate to always accommodate students' preferences, unless parents and teachers are aware of students' style preferences, providing a variety of educational experiences and finding the best way a particular student learns most would be difficult to ascertain.

Unlike such variables as ability, homework in general can be manipulated. Keith and Benson (1992) found that for students of Asian descent, intellectual ability had a small effect on school achievement, and more important, potentially manipulable variables had a stronger effect for Asian students than most other groups. They pointed out that the most easily manipulated variable of all, homework, had a particularly powerful effect for Asian students relative to other groups. At home, parents may not be able to manipulate the kind and amount of homework given by the teacher, but homework style elements are highly manipulable. By identifying the child's homework style preferences, parents can help their children to actually do their homework in their preferred way. With these efforts, it is reasonable to expect an improvement in homework and school achievement, similar to that attained when in-school learning environment was adjusted to match students' learning style.

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Table 1

Mean Homework Style Element Scores for the Low and High Perceived Homework Achievement Groups in Fifth and Seventh Graders

Homework style elements	Fifth grade			Seventh grade		
	α	Low $\underline{n} = 83$ \underline{M} (\underline{SD})	High $\underline{n} = 100$ \underline{M} (\underline{SD})	α	Low $\underline{n} = 70$ \underline{M} (\underline{SD})	High $\underline{n} = 72$ \underline{M} (\underline{SD})
Environmental						
Sound*** ###	.84	2.84 (1.25)	1.97 (1.01)	.87	2.96 (.98)	2.16 (.92)
Light** #	.76	3.71 (1.00)	4.22 (.99)	.77	3.82 (.81)	4.25 (.70)
Temperature	.76	2.89 (.93)	3.06 (.95)	.77	2.90 (.80)	2.78 (.73)
Design*** ###	.71	3.65 (.99)	4.29 (.78)	.80	3.58 (.84)	4.14 (.80)
Structural						
Structure** #	.64	3.72 (.88)	4.15 (.90)	.58	3.60 (.84)	4.00 (.68)
Set-order*** ###	.70	2.88 (.95)	3.60 (.96)	.77	2.76 (.79)	3.40 (.80)
Set-place*** ###	.82	3.51 (1.03)	4.09 (.90)	.84	3.31 (.98)	3.93 (.66)
Motivational						
Motivation*** ###	.72	3.53 (.79)	4.64 (.38)	.80	2.98 (.62)	4.18 (.50)
Persistence*** ###	.54	3.49 (.85)	4.12 (.57)	.58	3.18 (.64)	4.11 (.54)
Responsibility*** ###	.58	3.50 (.82)	4.34 (.63)	.72	2.89 (.60)	4.06 (.60)
Parent-mot*** ###	.70	3.20 (.91)	4.11 (.71)	.78	2.71 (.67)	3.61 (.83)
Teacher-mot*** ###	.69	3.37 (.80)	4.32 (.60)	.66	2.96 (.68)	3.88 (.76)
Perceptual/Physical						
Auditory	.63	3.41 (.81)	3.33 (.92)	.64	3.26 (.77)	3.43 (.73)
Visual	.64	2.81 (.83)	2.99 (.91)	.67	3.06 (.77)	2.99 (.80)
Tactile ^a ###	.76	3.33 (1.04)	3.68 (1.01)	.85	2.87 (1.02)	3.39 (.98)
Kinesthetic	.73	3.46 (.94)	3.52 (.82)	.77	3.11 (.81)	3.37 (.65)
Intake*** ###	.83	3.13 (1.14)	2.41 (1.01)	.85	3.29 (.98)	2.63 (.96)
Mobility*** ###	.75	2.76 (.97)	1.99 (.90)	.76	2.95 (.81)	2.06 (.64)
Individual/Social						
Alone-peer* ^a	.80	3.27 (1.09)	2.78 (1.11)	.85	3.06 (.94)	2.66 (1.02)
Authority figure	.87	2.42 (1.13)	2.54 (1.13)	.86	2.10 (.84)	2.18 (.84)

Note. The star sign (*) and pound sign (#) represent the significance levels for the fifth and seventh graders, respectively.

* $p < .005$. ** $p < .001$. *** $p < .0005$. ^a $p < .05$.

$p < .005$. ## $p < .001$. ### $p < .0005$. ^a $p < .05$.

Table 2
Mean Distinguishing Homework Style Element Scores for the Low and High Teacher-rated Homework and Academic Achievement Group in Fifth and Seventh Graders

Homework style elements	Fifth grade		Seventh grade	
	Low	High	Low	High
	<u>M (SD)</u>	<u>M (SD)</u>	<u>M (SD)</u>	<u>M (SD)</u>
Homework completion				
Motivation*** ####	4.01 (.76)	4.31 (.62)	3.30 (.63)	4.01 (.75)
Persistence* ####	3.72 (.75)	3.97 (.69)	3.37 (.72)	3.86 (.66)
Responsibility** ####	3.91 (.77)	4.20 (.68)	3.20 (.70)	3.97 (.76)
Parent-motivated <i>ns</i> ##	3.65 (.82)	3.72 (.77)	3.06 (.64)	3.45 (.89)
Teacher-motivated * ####	3.70 (.89)	3.96 (.82)	3.21 (.68)	3.71 (.80)
Light <i>ns</i> #	3.84 (.97)	4.12 (.99)	3.87 (.72)	4.20 (.73)
Design* <i>ns</i>	3.82 (1.03)	4.11 (.86)	3.85 (.87)	4.03 (.83)
Intake <i>ns</i> #	2.94 (1.07)	2.66 (1.13)	3.10 (.93)	2.69 (1.02)
Homework quality				
Motivation*** ####	3.97 (.80)	4.27 (.60)	3.31 (.66)	3.84 (.83)
Persistence*** ###	3.60 (.88)	3.94 (.68)	3.36 (.67)	3.72 (.70)
Responsibility*** ####	3.82 (.83)	4.18 (.67)	3.17 (.65)	3.76 (.84)
Teacher-motivated* #	3.68 (.94)	3.98 (.76)	3.29 (.60)	3.54 (.83)
Design* <i>ns</i>	3.92 (.97)	4.18 (.76)	3.76 (.86)	3.91 (.87)
Visual*** <i>ns</i>	2.69 (.91)	3.11 (.91)	2.93 (.83)	3.02 (.66)
Intake* <i>ns</i>	2.94 (1.16)	2.60 (1.08)	3.14 (.95)	2.91 (1.05)
Authority figure* <i>ns</i>	2.40 (1.10)	2.76 (1.21)	2.10 (.79)	2.23 (.95)
Academic achievement (math)				
Motivation <i>ns</i> ####	4.04 (.75)	4.24 (.70)	3.36 (.67)	3.93 (.71)
Persistence* ###	3.70 (.84)	4.00 (.66)	3.48 (.69)	3.85 (.66)
Responsibility**** ####	3.87 (.80)	4.33 (.60)	3.30 (.65)	3.92 (.73)
Teacher-motivated <i>ns</i> ###	3.71 (.80)	3.95 (.83)	3.28 (.69)	3.68 (.82)
Light* <i>ns</i>	3.86 (.93)	4.17 (.93)	3.99 (.77)	4.09 (.75)
Intake <i>ns</i> ##	2.72 (1.04)	2.74 (1.14)	3.21 (1.04)	2.75 (.91)

Note. The star sign (*) and pound sign (#) represent the significance levels for the fifth and seventh graders, respectively; *ns* = scores of the high/low groups were not significantly different.

* $p < .05$. ** $p < .01$. *** $p < .005$. **** $p < .0005$.

$p < .05$. ## $p < .01$. ### $p < .005$. #### $p < .0005$.



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