

Predicting Grades in Mathematics and English through Study Habits

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Abstract

The presents study investigated study habits (delay avoidance, work methods, teacher approval, and education acceptance) as predictors of grades in mathematics and English in a path model. There were several assumptions in past reviews accounting on how study habits directly explain grades in the presence of other factors but the present study isolated the effect of four study habits. There were 259 Filipino high school students who were requested to answer the Survey of Study Habits and Attitudes (SSHA) and their grades in mathematics and English for the first quarter were also asked. The four factors of study habits were first tested using a Confirmatory Factor Analysis (CFA) and the four-factor structure was proven having adequate fit ($\chi^2=47432.81$, $df=8745$, $RMS\ Standardized\ Residual=.01$, $RMSEA=.01$, $NFI=.94$, $GFI=.95$, $PGI=.97$). Path analysis was used to test the prediction of the four study habits to grade in mathematics and English and the model also had an adequate fit ($\chi^2=366.48$, $IFI=.98$, $NFI=.98$, $CFI=.98$, and $RMSEA=.09$). The path analysis revealed that work methods significantly predicted both grades in mathematics in science. Work method was the only predictor for mathematics and only teacher approval did not significantly predict grades in English. Further implications of the findings are discussed.

Keywords: Study habits, delay avoidance, work methods, teacher approval, and education acceptance, grades, mathematics, English.

Introduction

It is a common notion that when students in the school setting study hard their grades would improve. Asian learners are expected by their parents to develop good study habits for the sake of learning as reflected in having favourable grades in school (Magno, 2010). Even poor students who have developed good study habits can perform well in school (On & Watkins, 1994). Study habits are “those activities necessary to organize and complete schoolwork tasks and to prepare for and take tests” (Robbins et al., 2002). It is recognized in the present study that the study behavior adopted by students ultimately brings about the desired performance such as grades in school.

Brown and Holtzman in 1969 developed the Survey of Study Habits and Attitudes (SSHA) that was used to assess the students' attitudes and habits in studying. Despite being one of the oldest measures of study habits, it is the widest used instrument. The SSH measures specific study habit factors that includes delay/avoidance (related to delayed study habits and procrastination), work methods (student planning and work habits), teacher approval (students' perceptions of teachers), and educational acceptance (students' general perceptions of their acceptance of academic tasks and educational endeavors). The following definitions of the factors were taken from Hurlburt, Kroeker, and Gade (1991):

1. Delay Avoidance - a measure of the degree to which a student is prompt in completing assignments and is efficient in time management
2. Work Methods - a measure of effective use of study skills.
3. Teacher Approval - a measure of student opinions about teacher classroom behavior and methods.
4. Educational Acceptance - a measure of student approval of educational objectives, practices, and requirements.

Several validity and investigation of the SSHA was conducted. Bray, Maxwell, and Schmeck (1980) found marginal coefficient alpha and the Confirmatory Factor Analysis (CFA) did not support the four factors. However, there were several promising results for the SSHA. Holtzman and Brown (1968) reported the validity coefficients consisting of correlations between the total SSHA score, study orientation, and GPA ranged from .32-.66. Correlations between the scholastic aptitude test scores and grades were higher, ranging from .19-.83. Goldfried and D'Zurilla (1973) was the further established that prediction-criterion validity of the SSHA and indicated that when it was used to predict grades, the highest validity coefficients were obtained. Wakefield, Alston, Yom, and Doughtie (1974) correlated the SSHA and Vocational Preference Inventory and they found that certain dimensions run from academic to non-academic orientations establishing its concurrent validity. Hurlburt, Kroeker, and Gade (1991) were able to establish the discriminant validity of the SSHA factors across gender and year levels (junior vs. senior high school). There is a need to further establish the factor structure of the SSHA and internal consistencies considering that there is a lack of follow-up studies on the measure in the last three decades.

There are several studies that points to the significant contribution of study habits on students' grades. Robbins et al. (2004) reported in a metanalysis that there are over 109 studies investigating the effect of study habits on students' school-related outcome and the most common index is the students' grade. The students' grade reported in most studies is the Grade Point Average (GPA) when using a college sample. In their study, the relationship of study habits is positively related to grades but not as strong as its relationship with the SAT scores. In another study by Robbins et al., (2006), they constructed the Student Readiness Inventory (SRI) which also measure some pattern of study habit behaviors (i.e., academic discipline, emotional control, study skills). In their results, the study behavior patterns such as academic discipline, commitment to college, academic self-confidence, and general determination had the strongest relationships with the academic performance outcomes. The SRI factors had the largest contribution to grades (30.1%) as compared to other factors (SES and race ethnicity). Other studies have also emphasized the importance of study habits contribution to student grades. Murray and Wren (2003) concluded that traditional academic skills like study habits (using SSH) accounted for a significant amount of variable in explaining students' grades. Aluja and Blanch (2004) in their model found that study habits had a direct link on students' grades. When study habits were

added as a predictor of academic achievement (GPA) in their study, the explained variable (R^2) increased with .4 points as compared when other predictors were added. The same results were found by Nonis and Hudson (2006) that when study behaviour was added in the regression predicting grades, there was a significant increment in the explained variance (R^2). A similar pattern was found by Svanum and Bigatti (2006) that when study behaviour such as study effort was entered as a predictor of grades, it accounted for the largest contribution to grades (37% of grade variation) as compared to the contribution of outside activities (21%).

The Preset Study

Most studies in predicting students' grades do not account for the specific contribution of study habits. The focus of previous studies is explaining the contribution of study habits to grades with other psychosocial and general ability factors. The present study will look at the different effects of specific study habits on grades using the four factors of the SSHA: delay/avoidance, work methods, teacher approval, and educational acceptance. The SSHA was used to measure study habits because its results are more robust on grades as compared to other measures (see Murray & Wren, 2003).

Previous studies have looked at global and domain-general indicators of grades as an outcome. Much interest when specific subject grade are used such as domain-specific for Mathematics and English. Weissberg and Owen (2005) pointed that study skill factors in predicting school outcome may not be generalizable across heterogenous groups and institutional type. One possible source that might make a difference in the pattern of prediction is when grades are made specific to a particular subject area. Somuncoglu and Yildirim (1999) explained that study strategies have an important effect if it is based on a specific context or subject. The generalizability of study habits predicting grades might show a different pattern for domain-specific areas such as in Mathematics and English. In the present study, the four factors of study habits will be used to predict Mathematics and English grades of Filipino high school student in a path model.

Method

Participants

The participants in the study were 374 first year high school Filipino students. The ages of the students range from 11 to 15 years. There were 115 public school students and 259 from the private schools. The schools that were selected all used the same grading system and curricular focus.

Instruments

The Survey of Stud Habits and Attitudes was used to measure the study habits of the participants (Brown & Hultzman, 1956, 1957). The instrument measure specific factors on delay avoidance (When I sit down to study, I find myself too tired, bored, or sleepy to study effectively), work methods (When reading a long textbook assignment, I stop periodically and mentally review the main points that have been presented), teacher approval (My teachers succeed in making their subjects interesting and meaningful to me), and education acceptance (I strive to develop a sincere interest in every course I take). There is a total of 100 items with 25 items for each factor. Murray and Wren (2003) reported that coefficient alphas for each subscale were For the current sample, internal consistency reliabilities on the four SSHA subscales were adequate (Delay/Avoidance=.92; Work Methods=.88; Teacher Approval=.87; and Education Acceptance=.84). Criterion-prediction validity with grades as criterion was established from previous studies (i.e., Holtzman & Brown, 1968; Goldfried & D'Zurilla, 1973). The factor structure of the four factors was further tested in the present study.

The students grades in Mathematics and English for the fourth grading period was used. All schools selected have components on quizzes, quarterly test, recitation, assignment, and projects in the computation of the grades. The grades were used to reflect the academic outcome of students study habits. The grades range from 65 to 100. Passing grade is 75 and above.

Procedure

The school administrators from both the public and private schools were requested to allot one and a half hour of classroom time for the first year students. This time was used to administer and answer the SSHA. Standard procedures in administering the instrument was followed as indicated in the test manual. The instructions were read to the students and they were reminded that there are no right or wrong answers and to answer all items. The students' grades were requested from the mathematics and English teachers. The students were debriefed about the purpose of the study when they have completed the SSHA.

Results

The first part of the results presented the descriptive statistics of the SSHA factors and the grades. The second part confirmed the four factor structure of the SSHA using CFA. The last part tested a path model where the factors of the SSHA were used to predict grades in Mathematics and English.

Table 1
Means, Standard Deviation, Confidence Intervals, and Cronbach's Alpha of the SSHA and Grades

	N	M	CI		SD	Cronbach's Alpha
			-95%	95%		
Delay Avoidance	374	26.24	25.42	27.05	8.03	0.83
Work Method	374	25.24	24.53	25.95	6.98	0.81
Teacher Approval	374	25.23	24.51	25.95	7.06	0.78
Education Acceptance	374	27.23	26.53	27.93	6.91	0.90
Mathematics	374	78.66	78.16	79.16	4.93	
English	374	79.34	78.88	79.81	4.58	

Confidence interval estimates for the factors of the SSHA were in close range which means that accurate results were obtained. Mean grades for mathematics and English were not very high considering that the lowest passing grade is 75. Large variation of scores was obtained as indicated by the standard deviations. The items of the SSHA were all internally consistent especially the factor on education acceptance.

Table 2
Intercorrelations of the Four Factors of the SSHA

	Math	English	Delay Avoidance	Work Method	Teacher Approval	Education Acceptance
Math	---	.73***	.07	.17***	.11***	.14***
English		---	.07	.23***	.12***	.21***
Delay Avoidance			---	.62***	.52***	.61***
Work Method				---	.67***	.66***
Teacher Approval					---	.71***
Education Acceptance						---

* $p < .05$, ** $p < .01$, *** $p < .001$

When the factors of the SSHA were intercorrelated, all coefficients were significant with a positive magnitude. This indicates attainment of convergence among the four factors. The factor on work method had large correlations with other factors of the SSHA. All factors of the SSHA were significantly related to the grades in mathematics and English except for delay avoidance.

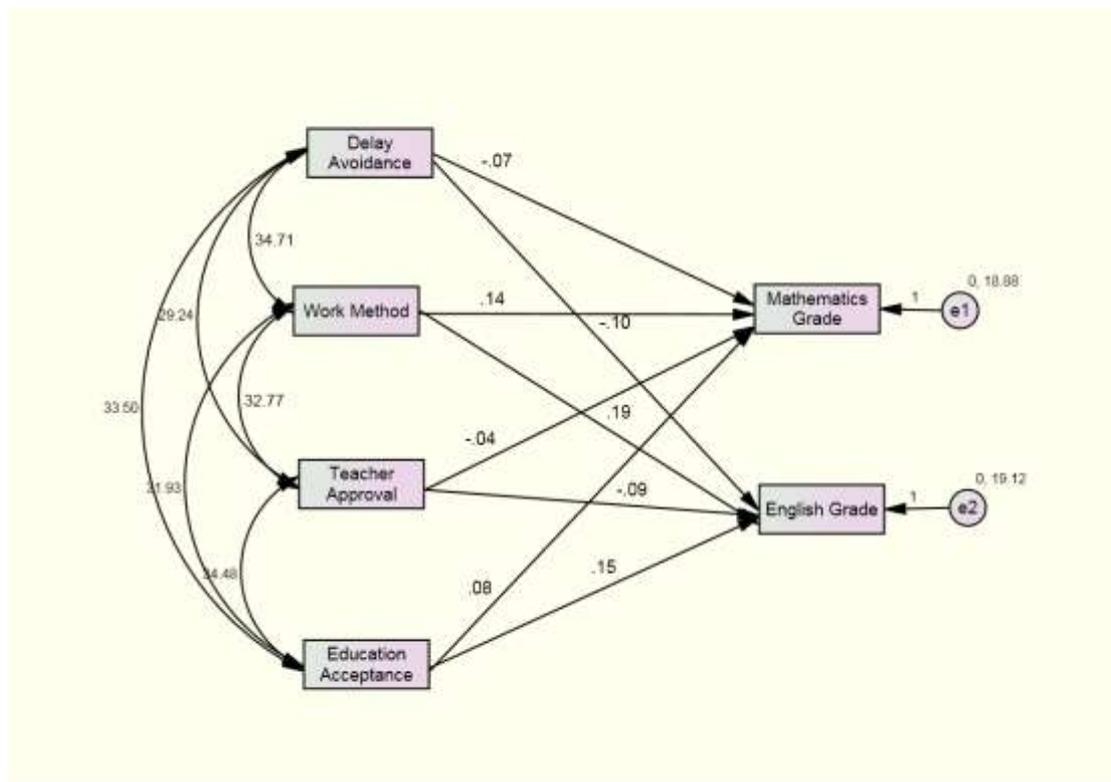
The four factors of the SSHA were tested using Confirmatory Factor Analysis (CFA). The CFA allows to test the proposition that the SSHA is said to be composed of the four factors. The parameters in measurement model (factor pattern, factor correlation, uniqueness) were estimated by maximum likelihood (ML). The ML is asymptotically unbiased and converge more quickly to their population values than most other estimators if the hypothesized model is true. The goodness of fit of the factor solution to the sample is also assessed.

The results showed that the four factor structure of the SSA was conformed. First, all parameter estimates of each 25 items under their latent factor was significant as well as the covariances among the four

latent factors, $p < .01$. Adequate goodness of fit was also attained, $\chi^2 = 47432.81$, $df = 8745$, RMS Standardized Residual = .01, RMSEA = .01, NFI = .94, GFI = .95, PGI = .97. There was no need to compare the four factor solution to a reduced factor solutions because the items already attained acceptable fit.

Path analysis was conducted where each SSHA factor was used to predict mathematics and English grades. The path analysis provides estimates of the magnitude and significance of hypothesised causal connections between sets of directly measured variables. The relative sizes of path coefficients in the analysis indicate which effect is better supported by the data.

Figure 1
Path Model of SSHA Predicting Grades in Mathematics and English



The results of the path model using unstandardized estimates indicate that work method is a common predictor for mathematics and English grades. The contribution of work method is the strongest than other study habits factor on mathematics (.14, $p < .05$) and English (.19, $p < .01$) grades. Work method is the only significant predictor for mathematics grade. For the English grades, delay avoidance, work method, and education acceptance were significant while teacher approval did not turn to be significant. Intercorrelations were significant among the factors of study habits, $p < .001$. The path model also attained an adequate fit as indicated by $\chi^2 = 366.48$, IFI = .98, NFI = .98, CFI = .98, and RMSEA = .09. The goodness of fit indicates that the path solution fits the data supporting the prediction of each grade.

Discussion

The study used the factors of the SSHA delay avoidance, work method, teacher approval, and education acceptance as predictors for grades in mathematics and English. It was also found in the study that the SSHA is still a useful instrument considering the adequate internal consistencies obtained and the factor structure was further proven. Moreover, convergence of the factors and the items all had significant paths.

The SSHA was supported in the study to be an adequate measure of study habits considering its index of reliability and validity found. The confidence interval at 95% are at close range which indicates that the mean score estimates (true score) are somewhat accurate. The items for each factor also showed to have acceptable internal consistencies (as shown by the Cronbach's alpha). The Cronbach's alpha value ranges from .78 to .90 indicating that the participants are consistent in their responses to the items under the same factor. Validity of the SSHA was shown in three ways, first is the convergence of the intercorrelation among the four factors of the SSHA which was also consistent with the covariances of latent factors in the CFA. Then, the items for each latent factor were significant indicating that they are still relevant measures of the construct. The four factor structure was proven by having an adequate fit. Previous studies have shown that major studies about the fidelity of the SSHA as a measurement tool were reduced starting in the 1980's. The present study reestablished the factorial validity of the tool designating that it is still appropriate to use as opposed to the findings of Bray, Maxwell, and Schmeck (1980). The findings by Bray, Maxwell, and Schmeck (1980) used a young sample which made the findings unstable. The usefulness of a tool is shown when the appropriate sample to whom it is intended for should be used to assess the accuracy of results (Magno, 2009a). The instrument is still recommended for use in the educational and research settings in order to assess more its validity and reliability. This will provide further support in the stability of findings in the present study. These findings support the usefulness of the SSHA as an instrument and can be used as a good measure for study habits. These preliminary procedures also justify the use of the four factors as predictors of the grades in mathematics and English in the path analysis.

The results in the path analysis showed that work method is a common significant predictor for both mathematics and English grades. Work method also had the largest regression coefficient that increases grades in mathematics and English as compared with the other three factors. It also showed to have a potent effect on both mathematics and English grades. Work method is focused on the strategic aspect of studying such a planning and specific work habits that is more cognitive in nature. The items of the work method seem to have both cognitive, metacognitive, and self-regulation content enabling the learner to exercise control over the information processed (see Magno, 2009b). This recognized the idea that cognitive strategies as reflected in work methods

are useful in improving students' grade when adapted well. Among other study habits, work methods is reflects the procedural aspect of studying that caters to more specific ways that student uses in processing information. This study habit seems to be very useful when studying for tests and other situations that require the mastery of specific materials. Work method being the strongest predictor among other study habits indicate the Filipino high school students in the specific setting included in the study make relies on their cognitive, metacognitive, and strategic thinking that applies best to learn and prepares them.

Given these findings two implications can be generated in the use of work methods: (1) Potential method that students find to be effective and (2) Further decomposition based on cognitive, metacognitive, and learning strategies.

Filipino students find work methods to be functional because of the specific cognitive, metacognitive, and dispositional strategies it provides them and perceived to work well in when studying. Specific work habits are found to be effective for learners because it targets the specific needs to students to be successful in different learning situations. The work methods are direct complements of the needs of students in learning. The work methods provide ways that makes the learner successful on school-related tasks.

Another implication is the further decomposition of work methods. Work methods reflect certain cognitive, metacognitive, and dispositional learning strategies that students use which they find as effective. This is inspired by contemporary studies like metacognition (i.e., Efklides, 2008; Veenman & Elshout, 1999) and self-regulation (Zimmerman, 2000) where specific methods for study strategies are decomposed. Work methods can be conceived as general ways of studying but the items show to have specific dimensions for studying that may include planning, monitoring, reviewing, memorizing, rehearsal, and others. What made work methods as a potent predictor in the study is the weight of all concepts integrated in it. It contains several methods, techniques, approaches, and strategies for learning that covered possible ways that the Filipino learner finds effective. Future studies may explore the components of work methods.

The study also found that work method was the sole significant predictor for mathematics and while other strategies significantly predict English grades except for teacher approval. This result further emphasizes the effectiveness of work methods as a predictor of grades and specially its usefulness in mathematics. There is a match between the content of work method items and the way Filipino learners process mathematics activities. This result further supports previous studies that specific work methods and learning strategies work well in processing mathematics (see Magno, 2009A; Ong, Liao, & Alimon, 2009).

The results also point the difficulty in using other study habits in explaining mathematics grade. Teacher approval, delay avoidance, and education acceptance do not seem to work well for mathematics but they do for increasing English grades except for teacher approval. Teacher approval did not predict both mathematics and English grades. One

implication is that mathematics may be perceived to be highly cognitive and participants may think that it is based on their effectiveness to perform well in mathematics and not on any other factors. But for English, it accounts for other factors like the value they see in English (education acceptance) and if they delay their work. This shows that students see mathematics as work driven while English, aside from work, needs acceptance on educational practices and being prompt in the submission of requirements. This also accounts for the differences in the requirements of the two subject areas that resulted to different pattern of predictors. Mathematics is cognitive based that strongly required work methods but in English several requirements needs to be considered because of the variety of task demands. For English courses, the Filipino learner struggles in learning the second language at the same time learns the content, syntax, rules, and applying the language to specific context which required more study habits.

Several learning components have been provided by reviews that could possibly increase students' achievement but complications have risen, for example motivation variables were found not to be directly linked with grades. Considering that there is a strong foundation support that study strategies are directly linked with grades regardless whether students are poor or not, adapting study habits was still proven as a potent predictor. This area was made more specific because it was found that not all study habits would predict domain grades when made domain-specific or subject specific. However, a common predictor would be work methods. This shows the applicability and usefulness of adapting work methods by Filipino learners for both mathematics and English learning.

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