# An Investigation of the Effects between Academic Self-concept, Nonacademic Self-concept, and Academic Achievement: Causal Ordering Models

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**Abstract**

The two purposes of this research were 1) to compare the goodness of fit index of causal ordering models of academic self-concept, nonacademic self-concept, and academic achievement with different self-concept factors and 2) to develop and to validate the causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement. The research sample consisted of 820 grad nine students. The research instrument consisted of Self-Descriptive Questionnaire and four academic achievement tests in four subjects. The data were repeatedly collected for three times. The data analyses were employed by descriptive statistics, MANOVA, and CFA.

The major findings were 1) the fully causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement including 2 factors of self-concept was the best fitted to the empirical data, 2) the model development and validation resulted in chi-square = 641.981, df = 600, p = 0.114, CFI = 0.998, NNFI=0.998, GFI = 0.957, and AGFI = 0.953. The second order effect of academic self-concept to academic achievement was the biggest effect, the third order effect of nonacademic self-concept to academic achievement was the biggest effect, and the third order effect of academic achievement to academic self-concept and nonacademic self-concept were the biggest effects.

Keywords: Academic Achievement, Academic Self-concept, Nonacademic Self-concept, Causal Ordering Model

## Introduction

In the present time, the student academic achievement was underlined to become the main direction in the national education because the student academic achievement is the most suitable indicators to show the educational successful. As this reason, every country have been tried to develop various learning processes for enhancing academic skills. Furthermore, this idea was obviously taken part in the educational policy in An Education Reform Act for Further Development for The Thai People: National Education Act of B.C. 2542. The major content emphasized the development of many functions of Thai education system (example: teachers, instruments, curriculum, administration and parent and community cooperation). After the act, the educational organization revealed the result of national achievement tests in six important subjects during the national education act have implemented. All of achievement scores were under satisfaction or under fifty percents every years. The trend of academic achievements was fluctuated in narrow scores. Moreover, most academic achievements have declined continuously in the last four years especially in Mathematics and English subject. This phenomenon made many questions about educational development process due to it cannot improve the factor that everyone has expected.

The crisis of academic achievement is not only important problem in Thailand but it also in many countries over the world. Most countries have resolved this problem by rapidly developing educational staffs and innovated for learning. In contrast, some countries look backward to elucidate in some important psychology variables linking with the student academic achievements for three decades ago. One of many interesting variables is self-concept, perception of oneself about strength, weakness, attitude, and value by social and environmental interaction (Rogers, 1951; Marsh & Craven, 1997; Slavin, 2003; Huitt, 2004). In theory, the person who have positive self-concept frequently success in activities but easily fail in activities for who have negative self-concept (Wigfield & Karpathian, 1991; Franken, 1994). The knowledge from many educational researches clearly pointed out that self-concept was the important factor effecting in student academic achievement. Self-concept was separated in two main factors; academic self-concept and nonacademic self-concept (Marsh & Shavelson, 1985; Marsh, 1990). The academic self-concept explained thirty-three percent in academic achievement variance (Lyon, 1993) and the nonacademic self-concept explain fourteen percent in academic achievement variance (William, 1993). For this result, Self-concept has been continuously selected to research and development in education, behavioral modification, and personal clinical therapy.

Recent sdudies reveal interesting methodologies and find effects between academic self-concept and academic achievement in longitudinal aspect with three time measurements (three waves) in a causal ordering model (Marsh, 1990; Guay, Marsh, & Boivin, 2003, Marsh, 2003). The effects in the model can be considered in four ways: Top-Down Effect (TD), Bottom-Up Effect (BU), Horizontal Effect (HE), and Reciprocal Effect (RE). All of these effects benefit to develop both academic achievement and academic self-concept in suitably period (the first year, the second year, and the third year). Causal Ordering Modeling was applying to study the longitudinal effects between two variables having interaction effects like academic achievement and academic self-concept (Guay, Mageau, & Vellerland, 2003; Trauwein, Lüdtke, Köller, 2006). Nevertheless, the causal ordering effect between self-concept and academic achievement was manifested just only one from two factors of self-concept. There is nonacademic self-concept not yet to elucidate in the same process and same model.

Nonacademic self-concept is about the perception of one-self in the nonacademic activities. It's involves with other groups of people in student's real life such as parent, friends, teacher, and community (Roger, 1959 cited in Hjelle & Ziegler, 1992; Mead, 1993

cited in Burn, 1979; Gross, 1992 cited in Reinecke, 1993). In addition, the nonacademic self-concept not only has a cause in the classroom, but it also has many outside classroom causes. It shows that nonacademic self-concept gives much more information than academic self-concept for improving student skill, character, behavior, social, and academic achievement. The results of this study may be used to guide teacher planning to help coordinate types of academic and nonacademic activities needed to improve student outcomes.

**Research Purposes**

The two purposes of this research were to compare the goodness of fit index of causal ordering models of academic self-concept, nonacademic self-concept, and academic achievement with different self-concept factors and to develop and validate the causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement.

**Theoretical Framework**

The research conceptual framework was developed from self-concept factors setting by Marsh and Shavelson (1985) and Marsh (1990) to select variables amalgamated with considering causal ordering effects from Guay, Mageau and Vellerland's causal ordering model (2003) for three research hypothetical models. Each model is three times repeated measures and different self-concept factors. The first model is a causal ordering model between academic self-concept, nonacademic self-concept, and academic achievement (full path model) [see figure 1], the second model is a causal ordering model between nonacademic self-concept and academic achievement [see figure 2], and the third model is a causal ordering model of academic self-concept and academic achievement [see figure 3]. Each hypothetical model has different latent variables and observed variables depend on research questions. The first latent variable is the academic achievement (ACH) defined by the achievement score from four subject tests measured in Mathematics (MAT), English (ENG), Science (SCI), and Thai Language (THA). The second latent variable as the academic self-concept (ASC) is defined by the student perception with themselves in strength, weakness, attitude, and value in academic competencies measured from four observe variables; Mathematics Academic Self-concept (MSC), English Academic Self-concept (ESC), Science Academic Self-concept (SSC), and Thai Language Academic Self-concept (TSC), and the last latent variable is the nonacademic self-concept (NSC) is defined by the student perception with themselves in strength, weakness, attitude, and value to achieve in nonacademic competencies measured from four observe variables; physical ability (PAB), peer relation (PER), physical appearance (PAP), and self-efficacy (SEF) (only one observe variable selected from related literature). The three hypothetical models were shown in figures 1-3 below.

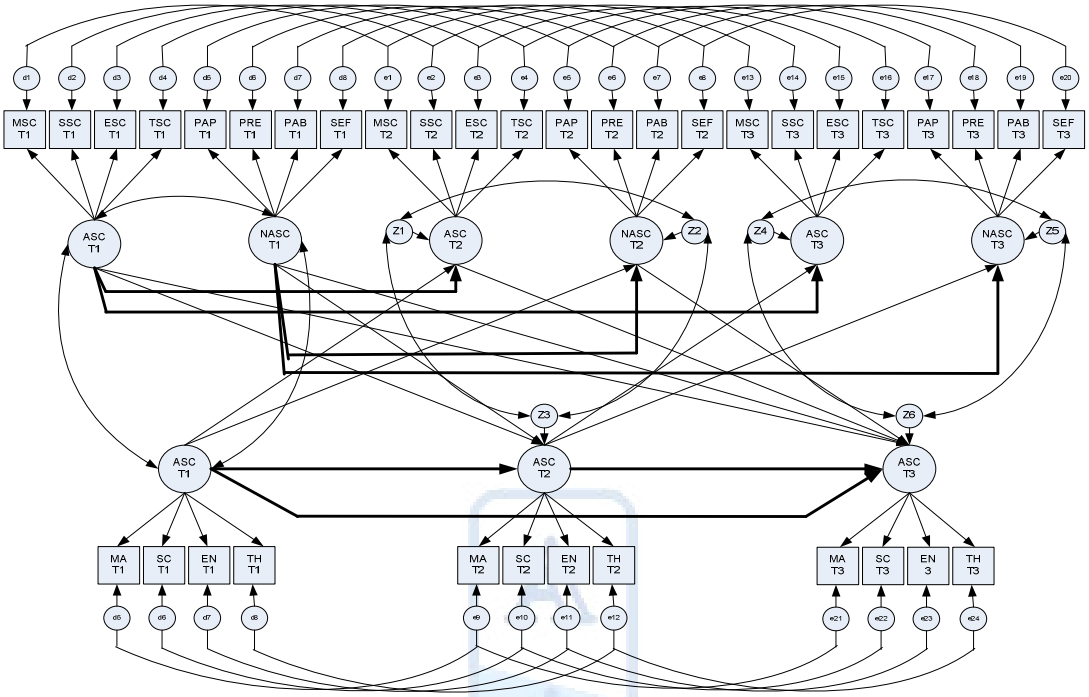


**Figure 1.** A causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement. (full path model)

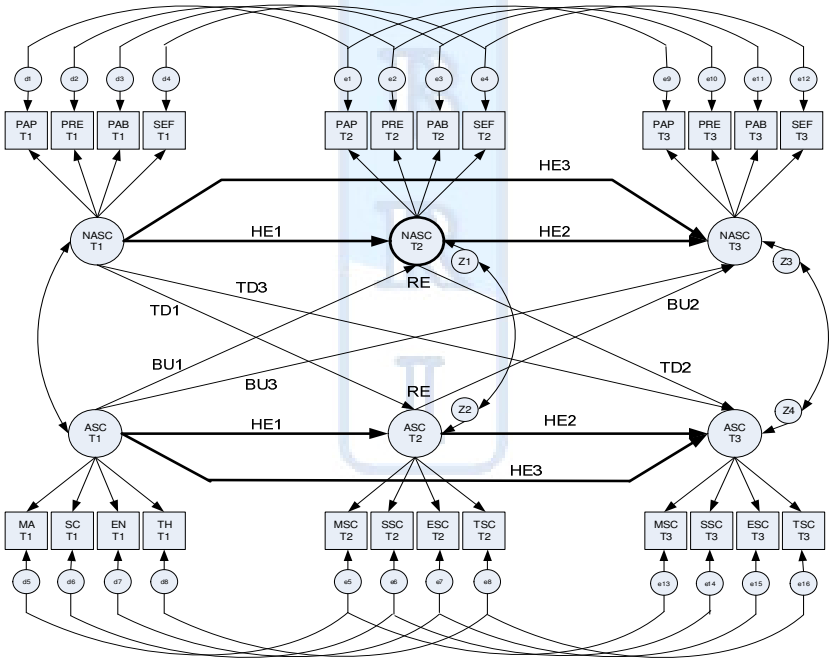


**Figure 2.** A causal ordering model of nonacademic self-concept and academic achievement.

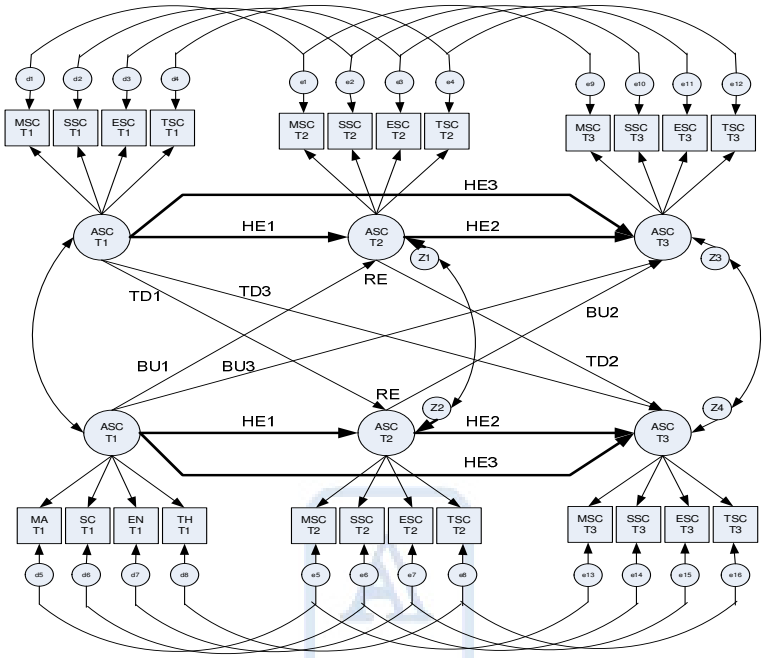


**Figure 3.** A causal ordering model of academic self-concept and academic achievement.

## Methodology

### Participants

The research population was ninth-grade students in public schools under the office of educational service area in six regions of Thailand. The research sample consisted of 820 students, 20 cases for each variable (Hair, Anderson, Tatham, & Black, 1998; Blentler & Chou, 1987 cited in Kelloway, 1998), 294 males and 526 females from all regions (north 139, central 130, west 125, east 134, south 138, and Bangkok/capital city 130 students) and obtained from three stage random sampling. The unite sampling of each stages were provinces, schools, and classes; respectively.

### Research Instruments

The research used two types of instruments. The first type was the student's self-descriptive questionnaire (six rating scales varied from the most unlike me to the most like me respectively) for measuring in self-concept variables, comprised with 78 items and reliability of 0.925. The guide lines of questions in the questionnaires were translated from SDQII (Marsh, 1998) in Mathematics academic self-concept, English academic self-concept, physical appearance, peer relation, and physical ability. The goodness of fit statistics from structural validity of a questionnaire shows good fit between the instrument factors and the empirical data [$\chi^2$=18.360, df=19, p=0.499, CFI=1.000, GFI=890, AGFI=0.790, and RMSEA=0.000]. The second type instrument was four student achievement tests in Mathematics, English, Science, and Thai Language subjects with 46 items, 50 items, 50 items, and 50 items respectively, mean of item difficulty 0.416, 0.452, 0.490, and 0.488 respectively, mean of item discrimination 0.425, 0.442, 0.473, and 0.460 respectively, and reliability of each test 0.865, 0.876, 0.893, and 0.897 respectively.

### Data Collection and Data Analysis

The research data was collected from three time measurements in the early period, middle period, and final period of an educational year with the same research sample. The

first set was collected at the early of May, 2007, the second set was collected at the end of September, 2007, and the third was collected at the end of February, 2008. Each instrument used an hour for data collection process per time. The research data was employed descriptive statistics to explore the basic data including with testing the mean different between gender and among three measurements by MANOVA and employed the confirmatory factor analysis (CFA) for model development and validation by using LISREL program. Each research sample was assigned six digit numbers to be code for easily linking each data measurement together.

**Results**

The basic result of three times data analyses from nine grad students were 296 males (36.09%) and 526 females (63.91%). The data distribution inclines to be normal distribution. The Thai Language Academic Self-Concept variable (TSC) has the highest mean score (3.01, 3.01, and 3.12 time order respectively) over all observed variables of Academic Self-Concept (ASC). The Peer Relation variable (PER) has the highest mean score (3.10, 3.12, and 3.19 time order respectively) over all observed variables of Nonacademic Self-Concept (NSC). The Thai Language Achievement variable (THA) has the highest mean score (21.27, 21.85, and 23.53 time order respectively) over all observed variables of Academic Achievement (ACH).The descriptive statistics shows in table 1. The multiple correlation analysis of 36 observed variables show 537 pairs were statistical significant at .01, 26 pairs were statistical significant at .05, and 93 pairs were no statistical significant. Furthermore, Three variable scores (MAT, SCI, and THA) of female were statistical significant at .01 grater than male, five variable scores (ENG, ESC, SSC, TSC, and PER) of females were statistical significant at .05 greater than males, and four variable scores no statistical significant. [see Appendix]

The result of confirmatory factor analysis of three research hypothetical models, the causal ordering model of academic self-concept, nonacademic self-concept and academic achievement (model 1) was the best fit with the empirical data with the relative chi-square 23.22. The second and the third best fit with the empirical data were the causal ordering of nonacademic self-concept and academic achievement (model 2) and the causal ordering of academic self-concept and academic achievement (model 3) with the relative chi-square 27.07 and 35.25 respectively. Moreover, the result from model comparison shows the statistical significant different at .05 during three research hypothetical models. The goodness of fit statistics of each research hypothetical models shows in table 2.

**Table 1 Descriptive statistics for repeated measures of research variables**

| Time | Variable | | Min | Max | $\overline{x}$ | S.D. | C.V. | Sk | Ku |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ACH1 | MAT1 | 4.00 | 36.00 | 14.62 | 4.96 | 0.34 | 0.91** | 1.23** |
| | | ENG1 | 5.00 | 37.00 | 16.58 | 5.91 | 0.36 | 0.97** | 0.71** |
| | | SCI1 | 8.00 | 41.00 | 19.93 | 6.18 | 0.31 | 0.65** | 0.24 |
| | | THA1 | 7.00 | 38.00 | **21.27** | 6.33 | 0.29 | 0.18* | -0.62** |
| | ASC1 | MSC1 | 0.20 | 5.00 | 2.46 | 0.75 | 0.30 | 0.01 | 0.45* |
| | | ESC1 | 0.50 | 4.90 | 2.48 | 0.68 | 0.27 | 0.36** | 0.73** |
| | | SSC1 | 0.50 | 5.00 | 2.70 | 0.67 | 0.25 | 0.59** | 0.98** |
| | | TSC1 | 0.20 | 5.00 | **3.01** | 0.77 | 0.26 | 0.42** | -0.17 |
| | NSC1 | PAB1 | 0.63 | 4.88 | 2.96 | 0.76 | 0.26 | -0.08 | -0.21 |
| | | PER1 | 1.11 | 5.00 | **3.10** | 0.68 | 0.22 | -0.04 | -0.07 |
| | | PAP1 | 0.63 | 5.00 | 2.68 | 0.68 | 0.25 | 0.23** | 0.46** |
| | | SEF1 | 0.85 | 4.85 | 2.76 | 0.62 | 0.22 | 0.53** | 1.04** |
| 2 | ACH2 | MAT2 | 4.00 | 40.00 | 15.22 | 6.00 | 0.39 | 1.33** | 2.13** |
| | | ENG2 | 6.00 | 43.00 | 17.09 | 6.10 | 0.36 | 1.11** | 1.12** |
| | | SCI2 | 6.00 | 42.00 | 21.65 | 6.38 | 0.29 | 0.56** | -0.10 |
| | | THA2 | 4.00 | 40.00 | **21.85** | 6.90 | 0.32 | 0.35** | -0.68** |
| | ASC2 | MSC2 | 0.30 | 5.00 | 2.58 | 0.74 | 0.29 | 0.13 | 0.46* |
| | | ESC2 | 0.20 | 5.00 | 2.62 | 0.68 | 0.26 | 0.26** | 0.70** |
| | | SSC2 | 0.60 | 5.00 | 2.78 | 0.66 | 0.24 | 0.32** | 1.05** |
| | | TSC2 | 1.00 | 5.00 | **3.01** | 0.67 | 0.22 | 0.51** | 0.16 |
| | NSC2 | PAB2 | 0.84 | 5.00 | 3.01 | 0.71 | 0.24 | 0.28** | -0.13 |
| | | PER2 | 1.00 | 4.89 | **3.12** | 0.66 | 0.21 | 0.15 | -0.19 |
| | | PAP2 | 0.75 | 4.75 | 2.75 | 0.59 | 0.21 | 0.37** | 0.57** |
| | | SEF2 | 1.08 | 5.00 | 2.75 | 0.55 | 0.20 | 0.77** | 1.80** |
| 3 | ACH3 | MAT3 | 4.00 | 43.00 | 17.20 | 6.67 | 0.39 | 1.15** | 1.13** |
| | | ENG3 | 4.00 | 42.00 | 18.78 | 6.77 | 0.36 | 0.90** | 0.81** |
| | | SCI3 | 8.00 | 45.00 | 22.82 | 7.26 | 0.32 | 0.43** | -0.13 |
| | | THA3 | 9.00 | 45.00 | **23.53** | 7.53 | 0.32 | 0.35** | -0.72** |
| | ASC3 | MSC3 | 0.20 | 5.00 | 2.69 | 0.75 | 0.28 | 0.04 | 0.45* |
| | | ESC3 | 0.20 | 5.00 | 2.70 | 0.75 | 0.28 | 0.17* | 0.65** |
| | | SSC3 | 0.20 | 5.00 | 2.93 | 0.66 | 0.23 | -0.20* | 1.52** |
| | | TSC3 | 0.60 | 5.00 | **3.12** | 0.64 | 0.21 | 0.32** | 0.40* |
| | NSC3 | PAB3 | 0.50 | 5.00 | 3.17 | 0.70 | 0.22 | 0.02 | 0.27 |
| | | PER3 | 0.67 | 5.00 | **3.19** | 0.61 | 0.19 | -0.02 | 0.52* |
| | | PAP3 | 0.38 | 5.00 | 2.89 | 0.64 | 0.22 | -0.04 | 1.73** |
| | | SEF3 | 1.00 | 4.90 | 2.86 | 0.58 | 0.20 | 0.54** | 1.33** |

* $p < 0.05$, ** $p < 0.01$

**Table 2 The goodness of fit index of three research hypothetical models.**

| model | $\chi^2$ | df | RMSEA | CFI | GFI | AGFI | $\chi^2$/df |
|---|---|---|---|---|---|---|---|
| 1 | 13238.06 | 570 | 0.16 | 0.75 | 0.53 | 0.45 | 23.22 |
| 2 | 6443.62 | 238 | 0.17 | 0.77 | 0.60 | 0.50 | 27.07 |
| 3 | 8425.13 | 239 | 0.20 | 0.77 | 0.54 | 0.42 | 35.25 |

| model comparison | $\Delta\chi^2$ | $\Delta$df | $\chi^2$/df | summary |
|---|---|---|---|---|
| 1 : 3 | 4812.93** | 331 | 23.22 : 35.25 | model 1 |
| 3 : 2 | 1981.51** | 1 | 35.25 : 27.07 | model 2 |
| 1 : 2 | 6794.44**- | 332 | 23.22 : 27.04 | model 1 |

** $p < 0.01$

The result of model development and validation, the causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement (model 1 or full self-concept factors model) was good fit with the empirical data with $\chi^2$ = 641.981, df=600,

p=0.114, CFI=0.998, GFI=0.957, AGFI=0.953, NNFI=0.998, RMSEA=0.009, and relative chi-square=1.069. Overall the model, the error of observed variables and latent variables inclined to decrease whereas most factor loadings of observed variables from three time repeated measures were continuously increased. The observed variables of academic achievement (ACH) were the highest factor scores during 0.643 to 0.819, the factor score of academic self-concept (ASC) were during 0.396 to 0.699, and the factor loading of nonacademic self-concept (NSC) were during 0.367 to 0.813.

For the direction of causal effect in the model including with 1) Top-Down effect (TD): The second order effect of top-down effect from academic self-concept (ASC) to academic achievement (ACH) was the highest effect and grater than the first order effect (the second highest effect) by four times approximately. The third order effect of top-down effect from nonacademic self-concept (NSC) to academic achievement (ACH) was the highest effect and grater than the first order effect (the second highest effect) by three times approximately. 2) Bottom-Up effect (BU): The third order effect of bottom-up effect from academic achievement (ACH) to academic self-concept (ASC) was the highest effect and grater than the second order effect (the second highest effect) by five times approximately. The third order effect of bottom-up effect from academic achievement (ACH) to nonacademic self-concept (NSC) was the highest effect and grater than the first order effect (the second highest effect) by one time approximately. 3) Horizontal effect (HE): The horizon of all three latent variables

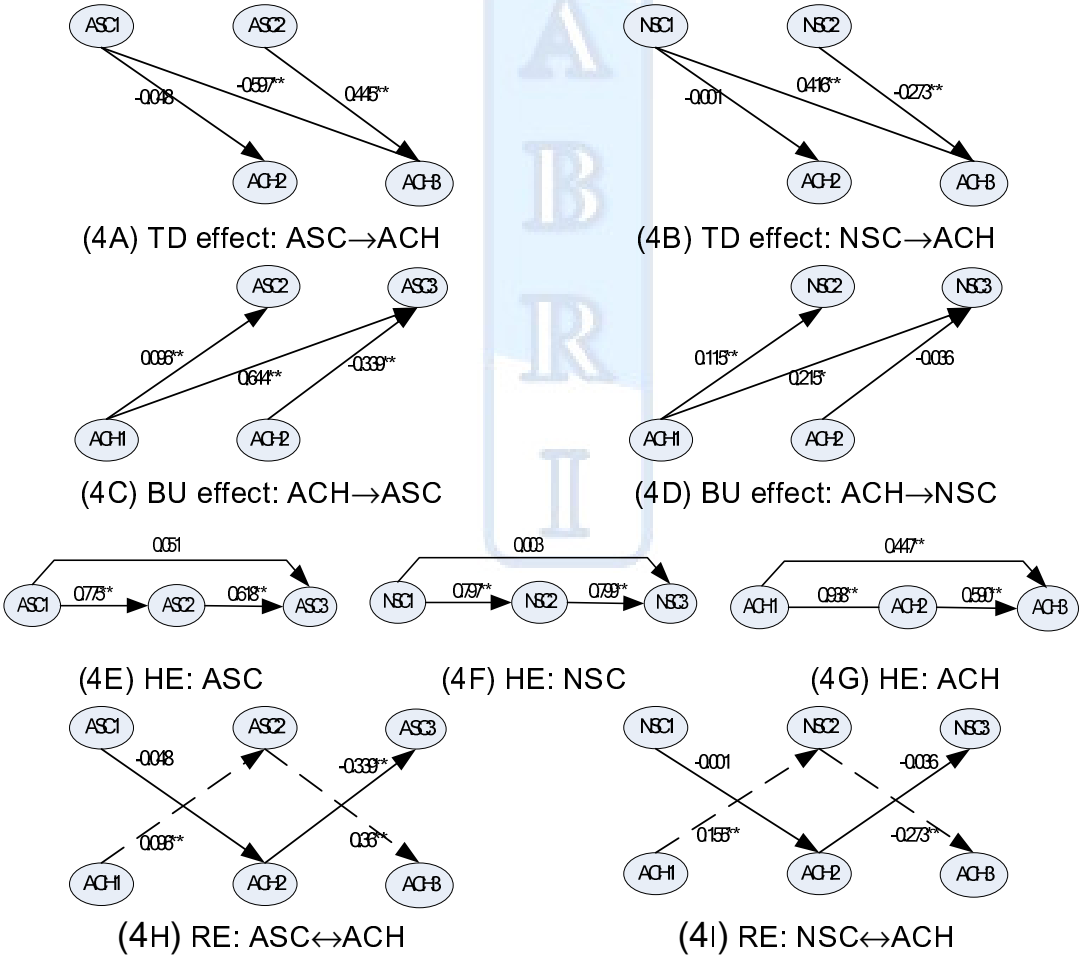


Figure 4. The causal paths of causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement.

has similar order. The first order effect was the highest effect and grater than the second and the third order, respectively. 4) Reciprocal effect (RE): The reciprocal effect from academic self-concept (ASC) to academic achievement (ACH) is positive and grater than the input effect three times approximately and the reciprocal effect from academic achievement (ACH) to academic self-concept (ASC) is negative and grater than the input effect three times approximately. The reciprocal effect from nonacademic self-concept (NSC) to academic achievement (ACH) is negative (opposite direction with the input effect) and grater than the input effect one time approximately and the reciprocal effect from academic achievement (ACH) to nonacademic self-concept (NSC) is negative (opposite direction with the input effect) and merely different with the input effect. The causal ordering effects were shown in figure 4 and figure 5. The percent variance explained in academic achievement, nonacademic self-concept, and academic achievement were 98.3%, 71.8%, and 68.9% , respectively.

**Discussion**

The result of causal ordering comparison show the best fit model which is the full path model with two factors of self-concept due to the model was measured from multiple observed variables more than other causal ordering models. In addition, the full path model was designed to use all two factors of self-concept which strongly supported the self-concept factor separation by March and Shavelson (1985). Further more, the rest two causal ordering models with different one factor of self-concept show the causal ordering of nonacademic self-concept and academic achievement were more fit with the empirical data than academic self-concept and academic achievement due to the nonacademic self-concept was social factor correlated with multiple important social factors from inside and outside student's school and community (Roger, 1959 cited in Hjelle & Ziegler, 1992; Mead, 1934 cited in Burn, 1979; Gross, 1992 cited in Reinecke, 1993). In contrast, the academic self-concept was affected just only from learning processes in the classroom. It is supported the important role of nonacademic self-concept in student's real life proposed by William (1993).

The result of model development and validation show the causal ordering model of academic self-concept, nonacademic self-concept, and academic achievement have good fit with the empirical data, CFI and NNFI should more than 0.90 and 0.95, respectively, and RMSEA should less than 0.05 (Guay, Mague, & Vellerland, 2003), due to the model was selected from the lowest relative chi-square of three research hypothesis models. More over, The model was used multiple highly correlated variables (more than 85% was significant at .01 level) rely on Guay, Mague and Vellerland's suggestion to measured at least three or more observed indicators in one latent variable, especially in the complex model.

From the fitted model, most the third order effects of TD and BU effects were highly and significantly. These all effects were one academic year effects which were supported from many prior research results that suggest at least one year period between each measurement will reveal dominantly effect between variables (Marsh, 2003; Guay, Marsh, & Boivin, 2003; Guay, Mageau, & Vallerland, 2003). However, the rest effect, the first order and the second order effect, some are negative effects and some are positive effects which contrast with prior research results due to two main reasons that 1) the short period of each measurement not enough to make dominantly effect cause of dissertation data collection limitation and 2) between the middle academic year, each school was during many special activities from inside and outside (e.g. assurance activity, sport competitive activity, special days, teacher evaluation for professionalization) that mainly disturb student learning activities

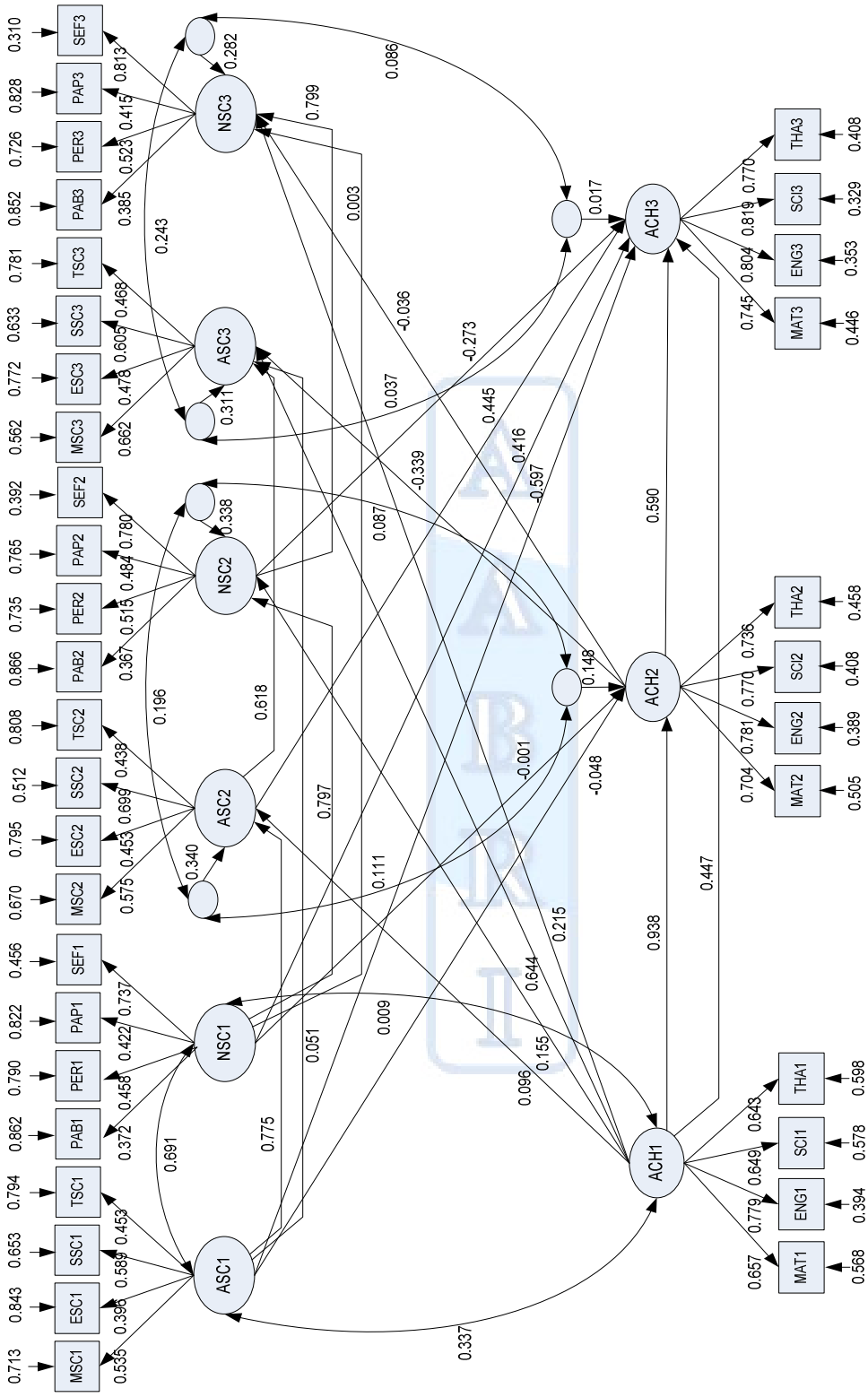


Figure 5. The causal ordering model of academic self, nonacademic self-concept, and academic achievement.

continuously. For these two reasons highly probably effects to four reciprocal effects differ from the result of prior research.

The horizontal effects of academic self-concept, nonacademic self-concept, and academic achievement were similar that is the first order effect is grater than the second order effect and the third order effect respectively. However, the third order effects between academic self-concept and nonacademic self-concept were different from academic achievement that is the third order effects of self-concepts were closely zero whereas the third order effect of academic achievement was more strongly and significantly because academic achievement was continuously developed since the student was young. The student was faced with academic experience in educational system for along time whereas academic self-concept and nonacademic self-concept were developed later than academic achievement when the age of student during adolescence and reactive with social (Fraine, Damme, & Onghena, 2007; Huitt, 2004; Marsh, 2003; Hartter, 1999; Sprintall , Sprintall, & Oja, 1998; Sprintall & Sprintall, 1990).

**Recommendations and Suggestions Future Research**

This study expands knowledge from prior researches and much remains to be done.

The following recommendations are made for implementation of the processes identified herein:

School administrators and teachers should emphasize to improve student positive self-concept both academic and nonacademic self-concept equal to improve student academic development. The research result reveal closely relationship between academic self-concept, nonacademic self-concept, and academic achievement especially during the early first semester which is the most important period to set various activity for improving student positive self-concept.

Administrators and teachers should fix the activities to improve nonacademic self-concept. The activities should be the closely and relatively with the student's interesting, not too easy and not exceed the student's potential, from easy to difficult. The teacher should select student group activities more than single activities when the first semester had begun. In addition, the teacher should fix the activities to improve academic achievement, especially in English and Science at the second semester had begun. The administrator and the teacher should brainstorm and fix the kind of the activities and period to take suitably the activities to the student.

The important role of teacher is a good reflector of the student's activity both in academic and nonacademic areas. Informing students about their progress and choices allows them to improve themselves. Many prior studies (e.g. Roberson & Stewart, 2006; Hay, 2005) confirmed the beneficial result when the researchers employed the reflection method in their experiments.

Most of the effects in the causal ordering model appear after the process was in place for a significant period (approximately one year). Structuring a similar study over a longer period of time may improve study validity.

**Note**

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## Appendix: Correlation matrix

| Var | MAT1 | ENG1 | SCI1 | THA1 | MSC1 | ESC1 | SSC1 | TSC1 | PAB1 | PER1 | PAP1 | SEF1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAT1 | 1.000 | | | | | | | | | | | |
| ENG1 | 0.498** | 1.000 | | | | | | | | | | |
| SCI1 | 0.458** | 0.505** | 1.000 | | | | | | | | | |
| THA1 | 0.402** | 0.496** | 0.446** | 1.000 | | | | | | | | |
| MSC1 | 0.228** | 0.047 | 0.175** | 0.103** | 1.000 | | | | | | | |
| ESC1 | 0.132** | 0.281** | 0.250** | 0.302** | 0.125** | 1.000 | | | | | | |
| SSC1 | 0.085* | 0.011 | 0.217** | 0.122** | 0.399** | 0.253** | 1.000 | | | | | |
| TSC1 | -0.005 | 0.004 | 0.118** | 0.219** | 0.160** | 0.281** | 0.230** | 1.000 | | | | |
| PAB1 | -0.115** | -0.235** | -0.142** | -0.087** | 0.213** | -0.016 | 0.211** | 0.263** | 1.000 | | | |
| PER1 | 0.068 | -0.019 | 0.059 | 0.029 | 0.177** | 0.073** | 0.223** | 0.170** | 0.246** | 1.000 | | |
| PAP1 | -0.109** | -0.171** | -0.035 | -0.049 | 0.068 | 0.075* | 0.220** | 0.265** | 0.337** | 0.261** | 1.000 | |
| SEF1 | 0.152** | -0.003 | 0.132** | 0.073* | 0.262** | 0.195** | 0.293** | 0.245** | 0.259** | 0.349** | 0.333** | 1.000 |
| MAT2 | 0.735** | 0.510** | 0.418** | 0.380** | 0.174** | 0.100** | 0.053 | -0.054 | -0.153** | 0.043 | -0.163** | 0.080* |
| ENG2 | 0.470** | 0.741** | 0.462** | 0.439** | -0.050 | 0.184** | -0.020 | 0.031 | -0.263** | -0.026 | -0.154** | -0.032 |
| SCI2 | 0.506** | 0.559** | 0.666** | 0.479** | 0.204** | 0.199** | 0.209** | 0.098** | -0.076* | 0.107** | -0.014 | 0.138** |
| THA2 | 0.433** | 0.554** | 0.467** | 0.732** | 0.059 | 0.263** | 0.125** | 0.196** | -0.123** | 0.035 | -0.071* | 0.062 |
| MSC2 | 0.259** | 0.090* | 0.204** | 0.197** | 0.763** | 0.122** | 0.303** | 0.180** | 0.180** | 0.141** | 0.016 | 0.211** |
| ESC2 | 0.077* | 0.238** | 0.189** | 0.219** | 0.087** | 0.657** | 0.187** | 0.303** | 0.015 | 0.047 | 0.112** | 0.206** |
| SSC2 | 0.100** | 0.111** | 0.226** | 0.200** | 0.355** | 0.172** | 0.641** | 0.142** | 0.126** | 0.225** | 0.164** | 0.266** |
| TSC2 | 0.034 | 0.101** | 0.119** | 0.302** | 0.119** | 0.223** | 0.171** | 0.639** | 0.162** | 0.181** | 0.175** | 0.192** |
| PAB2 | -0.044 | -0.130** | -0.056 | -0.059 | 0.171** | 0.009 | 0.186** | 0.264** | 0.644** | 0.220** | 0.241** | 0.217** |
| PER2 | 0.107** | 0.094** | 0.060 | 0.118** | 0.144** | 0.159** | 0.228** | 0.120** | 0.160** | 0.662** | 0.153** | 0.302** |
| PAP2 | -0.055 | -0.010 | 0.033 | 0.053 | 0.063 | 0.154** | 0.135** | 0.258** | 0.207** | 0.193** | 0.524** | 0.221** |
| SEF2 | 0.199** | 0.105** | 0.148** | 0.138** | 0.186** | 0.216** | 0.253** | 0.167** | 0.139** | 0.328** | 0.234** | 0.694** |
| MAT3 | 0.701** | 0.521** | 0.381** | 0.413** | 0.143** | 0.123** | 0.018 | -0.074* | -0.140** | 0.057 | -0.152** | 0.074* |
| ENG3 | 0.473** | 0.724** | 0.447** | 0.466** | -0.066 | 0.288** | -0.022 | -0.003 | -0.251** | -0.033 | -0.158** | 0.000 |
| SCI3 | 0.526** | 0.593** | 0.705** | 0.481** | 0.170** | 0.181** | 0.211** | 0.043 | -0.119** | 0.102** | -0.015 | 0.132** |
| THA3 | 0.445** | 0.596** | 0.492** | 0.774** | 0.068 | 0.292** | 0.075* | 0.163** | -0.100** | 0.058 | -0.044 | 0.079* |
| MSC3 | 0.335** | 0.237** | 0.319** | 0.256** | 0.711** | 0.150** | 0.298** | 0.137** | 0.102** | 0.081* | -0.025 | 0.188** |
| ESC3 | 0.138** | 0.321** | 0.232** | 0.297** | 0.045 | 0.641** | 0.157** | 0.180** | -0.032 | -0.004 | 0.035 | 0.148** |
| SSC3 | 0.136** | 0.219** | 0.303** | 0.214** | 0.317** | 0.230** | 0.624** | 0.144** | 0.064 | 0.059 | 0.120** | 0.202** |
| TSC3 | 0.080* | 0.207** | 0.191** | 0.332** | 0.068 | 0.300** | 0.172** | 0.624** | 0.089* | 0.111** | 0.142** | 0.166** |
| PAB3 | 0.016 | -0.024 | 0.018 | -0.016 | 0.151** | 0.006 | 0.155** | 0.229** | 0.653** | 0.149** | 0.256** | 0.190** |
| PER3 | 0.176** | 0.184** | 0.112** | 0.136** | 0.124** | 0.150** | 0.185** | 0.115** | 0.105** | 0.583** | 0.103** | 0.253** |
| PAP3 | -0.005 | 0.067 | 0.081* | 0.033 | -0.019 | 0.222** | 0.098** | 0.200** | 0.138** | 0.143** | 0.526** | 0.229** |
| SEF3 | 0.229** | 0.186** | 0.218** | 0.204** | 0.184** | 0.258** | 0.255** | 0.201** | 0.106** | 0.242** | 0.194** | 0.680** |
| $\bar{x}$ | 14.617 | 16.578 | 19.926 | 21.266 | 2.456 | 2.478 | 2.695 | 3.012 | 2.958 | 3.101 | 2.675 | 2.756 |
| S.D. | 4.960 | 5.911 | 6.178 | 6.328 | 0.753 | 0.678 | 0.670 | 0.773 | 0.761 | 0.680 | 0.677 | 0.615 |

Table 3. (continue)

| Var. | MAT2 | ENG2 | SCI2 | THA2 | MSC2 | ESC2 | SSC2 | TSC2 | PAB2 | PER2 | PAP2 | SEF2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAT2 | 1.000 | | | | | | | | | | | |
| ENG2 | 0.535** | 1.000 | | | | | | | | | | |
| SCI2 | 0.553** | 0.573** | 1.000 | | | | | | | | | |
| THA2 | 0.459** | 0.579** | 0.595** | 1.000 | | | | | | | | |
| MSC2 | 0.306** | 0.039 | 0.265** | 0.171** | 1.000 | | | | | | | |
| ESC2 | 0.129** | 0.254** | 0.218** | 0.298** | 0.211** | 1.000 | | | | | | |
| SSC2 | 0.129** | 0.060 | 0.264** | 0.207** | 0.361** | 0.204** | 1.000 | | | | | |
| TSC2 | 0.023 | 0.121** | 0.165** | 0.300** | 0.221** | 0.295** | 0.281** | 1.000 | | | | |
| PAB2 | -0.055 | -0.164** | 0.015 | -0.012 | 0.169** | 0.079* | 0.259** | 0.279** | 1.000 | | | |
| PER2 | 0.105** | 0.092** | 0.147** | 0.121** | 0.165** | 0.142** | 0.283** | 0.210** | 0.239** | 1.000 | | |
| PAP2 | -0.149** | -0.002 | 0.053 | 0.073* | 0.085* | 0.197** | 0.209** | 0.345** | 0.325** | 0.242** | 1.000 | |
| SEF2 | 0.178** | 0.104** | 0.218** | 0.140** | 0.247** | 0.272** | 0.374** | 0.272** | 0.245** | 0.421** | 0.290** | 1.000 |
| MAT3 | 0.825** | 0.573** | 0.551** | 0.508** | 0.272** | 0.122** | 0.090* | 0.027 | -0.044 | 0.130** | -0.127** | 0.170** |
| ENG3 | 0.542** | 0.796** | 0.539** | 0.572** | 0.070* | 0.285** | 0.089* | 0.150** | -0.126** | 0.111** | 0.031 | 0.119** |
| SCI3 | 0.560** | 0.614** | 0.811** | 0.582** | 0.213** | 0.132** | 0.240** | 0.090** | -0.050 | 0.141** | 0.032 | 0.165** |
| THA3 | 0.489** | 0.576** | 0.575** | 0.856** | 0.211** | 0.279** | 0.202** | 0.301** | -0.025 | 0.160** | 0.093** | 0.181** |
| MSC3 | 0.353** | 0.161** | 0.340** | 0.280** | 0.819** | 0.194** | 0.380** | 0.147** | 0.108** | 0.155** | 0.069* | 0.213** |
| ESC3 | 0.195** | 0.330** | 0.242** | 0.367** | 0.150** | 0.774** | 0.176** | 0.203** | 0.033 | 0.111** | 0.151** | 0.221** |
| SSC3 | 0.147** | 0.117** | 0.274** | 0.236** | 0.299** | 0.218** | 0.694** | 0.148** | 0.141** | 0.151** | 0.154** | 0.224** |
| TSC3 | 0.076* | 0.201** | 0.197** | 0.357** | 0.137** | 0.363** | 0.233** | 0.712** | 0.184** | 0.182** | 0.254** | 0.222** |
| PAB3 | -0.021 | -0.101** | 0.074* | 0.000 | 0.151** | 0.056 | 0.174** | 0.170** | 0.770** | 0.167** | 0.263** | 0.208** |
| PER3 | 0.181** | 0.173** | 0.198** | 0.169** | 0.166** | 0.141** | 0.250** | 0.205** | 0.186** | 0.791** | 0.218** | 0.367** |
| PAP3 | -0.089* | 0.071* | 0.080* | 0.096** | -0.006 | 0.240** | 0.135** | 0.248** | 0.205** | 0.193** | 0.699** | 0.279** |
| SEF3 | 0.211** | 0.182** | 0.249** | 0.255** | 0.228** | 0.298** | 0.354** | 0.237** | 0.204** | 0.319** | 0.263** | 0.772** |
| $\bar{x}$ | 15.218 | 17.089 | 21.648 | 21.851 | 2.582 | 2.624 | 2.780 | 3.014 | 3.014 | 3.123 | 2.751 | 2.753 |
| S.D. | 5.997 | 6.104 | 6.377 | 6.896 | 0.739 | 0.685 | 0.657 | 0.671 | 0.714 | 0.662 | 0.589 | 0.555 |
| Var. | MAT3 | ENG3 | SCI3 | THA3 | MSC3 | ESC3 | SSC3 | TSC3 | PAB3 | PER3 | PAP3 | SEF3 |
| MAT3 | 1.000 | | | | | | | | | | | |
| ENG3 | 0.619** | 1.000 | | | | | | | | | | |
| SCI3 | 0.610** | 0.594** | 1.000 | | | | | | | | | |
| THA3 | 0.558** | 0.628** | 0.635** | 1.000 | | | | | | | | |
| MSC3 | 0.361** | 0.192** | 0.364** | 0.322** | 1.000 | | | | | | | |
| ESC3 | 0.264** | 0.471** | 0.261** | 0.372** | 0.263** | 1.000 | | | | | | |
| SSC3 | 0.140** | 0.171** | 0.356** | 0.248** | 0.471** | 0.286** | 1.000 | | | | | |
| TSC3 | 0.097** | 0.249** | 0.175** | 0.387** | 0.200** | 0.360** | 0.309** | 1.000 | | | | |
| PAB3 | -0.012 | -0.043 | 0.045 | 0.027 | 0.179** | 0.069* | 0.216** | 0.219** | 1.000 | | | |
| PER3 | 0.219** | 0.228** | 0.222** | 0.234** | 0.205** | 0.174** | 0.227** | 0.245** | 0.202** | 1.000 | | |
| PAP3 | -0.031 | 0.107** | 0.087** | 0.117** | 0.030 | 0.257** | 0.181** | 0.264** | 0.261** | 0.287** | 1.000 | |
| SEF3 | 0.267** | 0.258** | 0.287** | 0.294** | 0.312** | 0.364** | 0.357** | 0.309** | 0.269** | 0.412** | 0.365** | 1.000 |
| $\bar{x}$ | 17.199 | 18.780 | 22.820 | 23.527 | 2.688 | 2.702 | 2.930 | 3.125 | 3.172 | 3.186 | 2.891 | 2.859 |
| S.D. | 6.669 | 6.774 | 7.257 | 7.534 | 0.746 | 0.746 | 0.660 | 0.641 | 0.703 | 0.614 | 0.642 | 0.582 |