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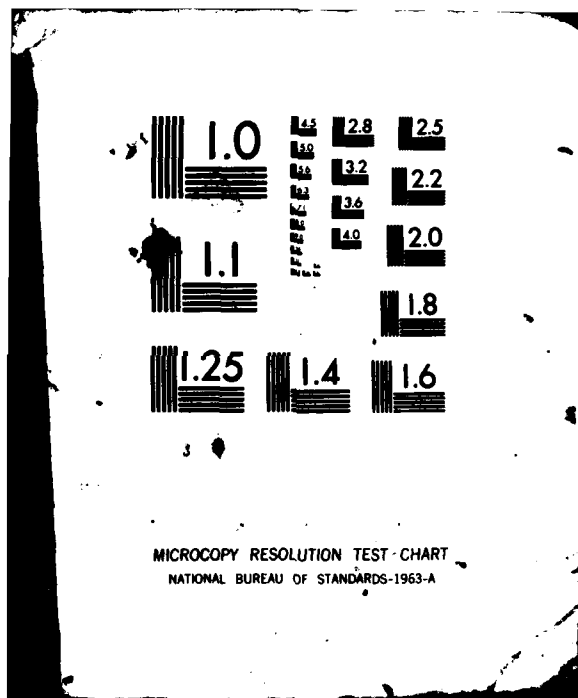
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SELF-CONCEPT: THE INTERPLAY OF THEORY AND METHODS

Richard J. Shavelson and Roger Bolus

April 1981

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SELF-CONCEPT: THE INTERPLAY OF THEORY AND METHODS

Richard J. Shavelson and Roger Bolus

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The enhancement of students' self-concepts is valued as a goal of education, and as a moderator and perhaps a cause of scholastic achievement. Nevertheless, conceptual and methodological problems have plagued research and evaluations involving self-concept (Scheirer & Kraut, 1979; Shavelson, Hubner & Stanton, 1976). The purposes of this article, in broad terms, are (a) to advance self-concept theory by testing some of its critical assumptions; and (b) to present recent methodological advances which integrate concerns about measurement, statistics, and theory into one conceptual, analytic framework.

Self-concept, broadly defined, is a person's perception of him or herself. These perceptions are formed through one's experience with and interpretations of one's environment, and are influenced especially by reinforcements, evaluations of significant others, and one's attributions for one's own behavior (Shavelson, Hubner & Stanton, 1976). The construct, self-concept, can be further defined by seven critical features (cf. Shavelson et al., 1976; see Fig. 1): (1) It is organized or structured in that people categorize the vast information they have about themselves and relate these categories to one another. (2) It is multifaceted and the particular facets reflect the category system adopted by a particular individual and/or shared by a group. (3) It is hierarchical with perceptions of behavior at the base moving to inferences about self in subareas (e.g., academic--English, history), academic and nonacademic areas, and then to general self-concept. (4) General self-concept is stable but, as one descends the hierarchy, self-concept becomes increasingly situation-specific and as a consequence less stable. (5) Self-concept becomes increasingly multi-faceted as the individual develops from infancy to adulthood. (6) It has both a descriptive and an evaluative dimension such that individuals may describe themselves (I am happy) and evaluate themselves (e.g., I do well in school). And (7) it can be differentiated from other constructs such as academic achievement.

Research on substantive topics in self-concept theory has already been reviewed (e.g., Wylie, 1979) as has research on methodological

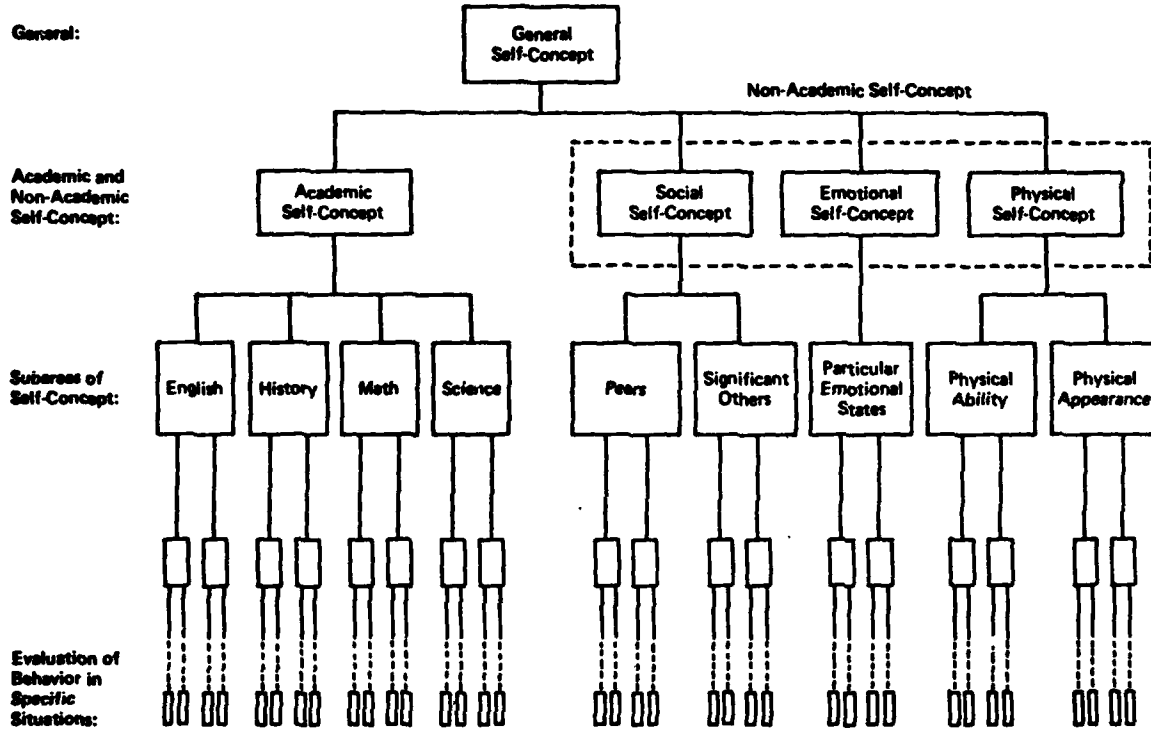


Figure 1--Structure of Self-Concept

issues in self-concept research (e.g., Shavelson et al., 1976; Shavelson, Burstein & Keesling, 1977; Shavelson & Stuart, 1980). A comprehensive review of the self-concept literature, then, is unnecessary. Rather research is reviewed which directly relates to the hierarchical, multi-faceted nature of self-concept and the causal relation between self-concept and achievement.

Hierarchical, Multi-Faceted Nature of Self-Concept

The multi-faceted nature of self-concept has been more implicit than explicit in research on and reviews of self-concept (e.g., Shavelson et al., 1976; Wylie, 1979). Only a few studies have systematically examined this aspect of self-concept. Most of this research supports a multi-faceted interpretation of the construct (e.g., Fernandes, 1978; Fernandes, Michaels and Smith, 1978; Fleming & Watts, in press; Kokenes, 1974; Piers & Harris, 1964; Michaels, Smith & Michaels, 1975; Shavelson et al., 1976; Shepard, 1979; Wylie, 1979).

Studies by Marx and Winne (1978), and Winne, Marx, and Taylor (1977) are noteworthy because they purported not to support the multi-faceted interpretation of self-concept. For example, Winne et al. (1977, p. 900) concluded that:

Use of separate subscale scores are likely to lead to some misinterpretations of the internal structure of the construct ...self-concept seems a more unitary construct rather than one broken down into distinct subparts or facets in the nomological network....Much of the construct is shared and undifferentiable, but individual facets may be more or less relevant when self-concept is related to other constructs like achievement [sic. (!); italics ours].

Upon close examination, the results and conclusions of these two studies may be misleading. In both studies, the Self-Concept Inventory (Sears, Note 1), the How I See Myself scale (Gordon, Note 2), and the Way I Feel About Myself scale (Piers & Harris, 1964) were administered to 103 3rd-6th graders (Winne et al., 1977) and again to 488 6th graders (Marx & Winne, 1978). Three subscales, purporting to measure three facets of self-concept--physical, social, and academic--were formed on

the basis of subjective interpretation of subscale labels. Hence both studies used the same measures of self-concept in the multitrait-multi-method (MTMM) design (cf. Campbell & Fiske, 1969) with three methods (the three instruments) and three traits (i.e., facets). Finally, correlations corrected for unreliability of measurement (i.e., corrected for attenuation), rather than the zero-order correlations, were entered into the MTMM design and examined for convergent and divergent validity.

Three limitations of these studies are immediately apparent from this description. First, diverse subscales were categorized subjectively as belonging to one of three facets--academic, social, and physical--for each instrument despite warnings about the interpretability of the instruments' original subscales (Shavelson et al., 1976). Second, the MTMM design calls for maximally dissimilar methods (i.e., instruments), while the three methods employed are very similar (i.e., self report questionnaires). Hence, high method covariation should lead to problems in differentiating subscales (facets). And third, the correction for attenuation assumes strictly parallel tests (equal means, variances, and covariances with each other and an outside criterion). If these assumptions are not met, the correction produces spuriously high, disattenuated correlations (in some cases greater than 1.00). This may be the case for the data reported in the two studies.

In order to overcome some of the methodological limitations of these studies, we disattenuated the correlations in the Marx and Winne (1978) study using the reliabilities they reported. And we selected one subscale on each instrument to represent each facet (physical, social, academic). More specifically, for each subjective category (facet; e.g., social self-concept), we selected one subscale from each of the three instruments such that the correlations among these three subscales were higher than any other correlations among subscales categorized together (i.e., highest convergent validity coefficients). We reasoned that the convergent validity coefficients were the best evidence that each subscale measured the same facet. Since the test of the multi-faceted nature of self-concept rests on showing that the measures of social self-concept, for example, correlate higher with each other than with other measures of self-concept such as physical

or academic self-concept, this selection of data seemed reasonable. The resulting MTMM is presented in Table 1.

From the data in Table 1, we concluded that there is evidence for a multi-faceted feature of self-concept. Even though there is still a strong method correlation in the data (.27), different measures of the same trait are more highly correlated with one another than with different measures of different traits (except in one case .47 vs. .48). Method correlation is, as expected, most problematic when different traits are measured by the same instrument. Nevertheless, the correlations among the three traits measured by the same instrument are lower than reported by Marx and Winne (1978).

In summary, research on self-concept supports the multi-faceted interpretation of self-concept. However, a test of the hierarchical, multi-faceted nature of self-concept still remains to be done. Such a test might use multiple measures of one or more facets of (say) academic self-concept and of general self-concept. In this way, the hierarchical aspect could be examined along with the multi-faceted aspect of self-concept. Our data bear on this kind of study.

Causal Relation Between Self-Concept and Academic Achievement

Research on the relation between self-concept and indices of academic achievement such as grades and test scores has found, as expected, positive correlations of about .30. Measures of academic self-concept and indices of achievement tend to be higher than correlations between general self-concept and achievement (for reviews supporting these assertions, see Shavelson et al., 1976; Wylie, 1979).

While self-concept theorists, supported by empirical research, agree that self-concept and achievement are related, there is by no means agreement as to the causal ordering. Shavelson and Stuart (1980), for example, argued that, while causation is probably reciprocal, achievement is causally predominant (cf. Calsyn & Kenny, 1977). In contrast, Scheirer and Kraut (1979; see also Anderson & Evans, 1974) posited self-concept as a cause of achievement. Theorists disagree on the causal predominance for at least two reasons. A theoretical model of the causal dominance of achievement or self-concept has not been

Table 1
Multitrait-Multimethod Matrix
for Data from Marx and Winne (1978)

| | | Method 1 | | | Method 2 | | | Method 3 | | |
|--------|-------------|------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | | P | S | A | P | S | A | P | S | A |
| Method | Physical(P) | <u>.70^a</u> | | | | | | | | |
| 1 | Social(S) | .69 | <u>.73</u> | | | | | | | |
| | Academic(A) | .51 | .53 | <u>.66</u> | | | | | | |
| Method | P | <u>.58^b</u> | .48 | .36 | <u>.80</u> | | | | | |
| 2 | S | .44 | <u>.47</u> | .30 | .69 | <u>.79</u> | | | | |
| | A | .44 | .44 | <u>.58</u> | .49 | .65 | <u>.80</u> | | | |
| Method | P | <u>.53</u> | .39 | .29 | <u>.52</u> | .40 | .40 | <u>.72</u> | | |
| 3 | S | .34 | <u>.42</u> | .28 | .42 | <u>.51</u> | .39 | .58 | <u>.76</u> | |
| | A | .31 | .38 | <u>.60</u> | .29 | .27 | <u>.50</u> | .49 | .48 | <u>.85</u> |

a denotes reliability coefficient

b== denotes a convergent validity coefficient

formulated in a thorough, logical manner (Spears & Deese, 1973). And, until recently, methods for examining causality from ecologically valid, correlational studies have not been widely used (Shavelson & Stuart, 1980; Calsyn & Kenny, 1977).

Scheirer and Kraut (1979) reviewed research bearing on the causal predominance of self-concept. They concluded that "a number of laboratory studies have shown effects from short term manipulation of self-esteem...but the application of research based on artificially created self-concept changes is doubtful. Results tend to be contradictory... and short lived" (p. 132; see also Shavelson & Stuart, 1980). For this reason, they reviewed evaluations of educational programs which have attempted to change self-concept in vivo. After selecting studies which were minimally defensible on methodological grounds, they found no support for the proposition that changes in self-concept caused changes in achievement. After citing weak theory and methods as possible explanations for their findings, they offered this alternative explanation consistent with the findings of Calsyn and Kenny (1977):

An alternative view is that motivation for academic learning comes from the reinforcement of one's social environment for specific learned skills; this is, of course, the position of behaviorist learning theory. In this view, self-concept change is likely to be an outcome of increased achievement with accompanying social approval, rather than an intervening variable necessary for achievement to occur. (Scheirer & Kraut, 1979, p. 144.)

Clearly, further theoretical work and empirical research are needed to clarify the causal relation between self-concept and achievement. The data reported here bear on the causal predominance of self-concept and achievement.

Based on the definition of self-concept and the literature reviewed, several hypotheses can be set forth regarding the nature of self-concept. First, self-concept is multi-faceted. That is, self-concept is comprised of several correlated facets. Second, the multi-faceted structure of self-concept is stable over a short period of time. Third, general self-concept is more stable over time than academic

self-concept which, in turn, is more stable than self-concept in specific academic subareas (e.g., self-concept in mathematics, see Fig. 1). Fourth, academic achievement is distinguishable from the multiple facets of self-concept. More specifically, academic achievement in a subject matter (say mathematics) should correlate highest with self-concept in the same subject matter (mathematics). This correlation, however, should not be so close to unity so as to make the constructs of self-concept and achievement indistinguishable (Shavelson et al., 1976). Moreover, as one moves up the self-concept hierarchy (Fig. 1), the correlation between achievement and self-concept should systematically decrease. Finally, the causal predominance of self-concept over achievement (or vice versa) will be explored. Neither theory nor past research permits us to formulate a hypothesis about the direction of causality.

Specifically, then, the purposes of this article are (a) to test the assumptions of a multi-faceted, hierarchical construct with increasing stability toward the apex, a construct which can be differentiated from academic achievement; (b) to examine the causal predominance of self-concept over achievement, or vice versa; and (c) to demonstrate how the method of covariance structure analysis (e.g., Bentler, 1980) can be used to examine measurement, structural and theoretical concerns (e.g., causal predominance) simultaneously.

METHODS

Overview of the Study

In order to test the assumption of a hierarchical, multi-faceted structure of self-concept, at least one area of self-concept (see Fig. 1) must be measured and the measurements must be made at two or more levels of the hierarchy (multiple facets, see Fig. 1). In this study, general self-concept (GSC), academic self-concept (ASC), and subject-matter-specific self-concepts in English (SCE), math (SCM), and science (SCS) were measured along with grades in English (GE), math (GM), and science (GS).

In order to examine the causal predominance of self-concept over achievement (or vice versa), three conditions have to be fulfilled

(e.g., Shavelson, 1980; Shavelson & Stuart, 1980): (a) a statistical relation between self-concept and achievement must be established, (b) a time precedence must be established, and (c) a model of the causal relation must be correctly specified. In this study, grades were used to measure academic achievement. They were correlated with the measures of self-concept in order to establish a statistical relation between self-concept and achievement. The self-concept and achievement measurements were taken at two points in time, February 1980 and June 1980, so as to establish time precedence. And the model used to examine causal predominance was developed, in large part, by Shavelson and Stuart (1980) and is consistent with other models testing causal predominance (e.g., Calsyn & Kenny, 1977; Kenny, 1979).

In examining both the measurement model--the hierarchical, multi-faceted nature of self-concept--and the structural model--causal predominance--it is desirable to have multiple measures of each construct. This is because multiple measures of a construct can be used to: (a) triangulate on the construct, (b) argue for the validity of construct interpretations (cf. MTMM Matrix; see Shavelson et al., 1976) and (c) estimate the causal relation between latent constructs rather than between observed measures containing measurement error. For these reasons, two measures (indicators) of GSC, ASC, and subject-matter self-concepts were obtained. The two measures of GSC, for example, should correlate higher with each other than with measures of either ASC or the subject-matter self-concepts.

Structural equation modeling was used to examine the structure of self-concept, its stability over time, and the causal predominance between self-concept and achievement. In particular, the analysis of covariance structures was used to examine the data (e.g., Bentler, 1980).

Sample and Procedures

The original sample consisted of 130 7th and 8th grade students from an intermediate school located in a predominantly white, upper-middle-class, suburban community outside of greater Los Angeles. The sample was composed of 69 boys and 61 girls, all but five of whom were

of Anglo origin. This sample represented approximately 85% of the total 7th and 8th grade students requested to participate. (About 15 percent of the students either refused to participate or failed to obtain parental permission.)

The students were administered a battery of self-concept instruments (see instrumentation below) by one of the authors during a scheduled 50 minute class session in February 1980. On the following day, a standardized achievement test was given. This initial data collection took place two weeks after first semester grades were received. A second data collection, replicating the procedures in February, was carried out in June 1980, one week before the end of school. Due to absences at the final testing dates and school transfers, 15 percent ($n = 20$) of the original 130 students did not participate in the second data collection. An addition 15 percent of the original sample was dropped from the study due to incomplete data (e.g., dropping out of a particular class during the second semester of the academic year or failing to complete the self-concept battery). The final sample consisted of 99 students: 50 males and 49 females.

Instrumentation

The self-concept test battery consisted of six instruments: two measures of global self-concept, two measures of a general academic self-concept and two measures of subject-matter-specific (English, mathematics, and science) self-concept. All instruments were self-report multiple-choice or true-false type formats. The 80-item Way I Feel About Myself (WIFM; Piers & Harris, 1964) and the 100-item Tennessee Self-Concept scale (TSC; Fitts, Note 3) were selected as measures of general self-concept (cf. Shavelson et al., 1976, and Bentler, 1972, for a review of the construct validity of these instruments). The 8-item Michigan State Self-Concept of Ability (scale), Form A (Brookover et al., Note 4), was divided into two parallel composites and used as measures of academic self-concept (ASC). Subject-matter self-concept was measured with the 8-item Brookover Form B. Items on Form B are identical to those on Form A, except that Form B elicits responses relative to a particular subject-matter area (e.g., "How do you rate

your ability in English compared to your close friends'?). The subject-matter self-concept scales were each divided into two parallel composites which were used as measures of self-concept in English, math, and science. Finally, first and second semester grades in English, math, and science, obtained from students' files, were converted to a 13-point, numeric scale (A+ = 13, A = 12, ... F = 1) and used to measure academic achievement.

Analysis Strategy

In addition to zero-order correlations, an analysis of the covariance structure of the data, using LISREL IV (Joreskog & Sorbom, 1978), was used to examine hypotheses regarding the structure of self-concept, the stability of self-concept, and the causal predominance of self-concept and achievement. Figure 2 summarizes the data collected in the study and the hypothesized relations in the data. And it provides the basis for data analysis.

The boxes in the figure represent the measurements, referred to as manifest variables, while the circles represent the constructs, referred to as latent variables which underlie the measurements. The straight arrows from the latent variables (circles) to their respective measurements (boxes) indicate that the constructs cause the performance on the measures. The coefficients associated with these arrows are synonymous with factor loadings in a factor analysis. The curved arrows indicate correlational, not causal, relationships among the constructs. Unidentified sources of variation or disturbances in the model, including random error, are represented in the figure by a lower case e.

The straight arrows between constructs represent hypothesized causal relationships. Thus for each construct at time 2, an equation can be written. The equation expresses that construct in terms of other variables in the model plus a disturbance term. The disturbance term represents random error and systematic variation not represented in the model. The strength of these causal paths is measured by regression coefficients. Correlations among the disturbance terms (not shown in Fig. 2) indicate that variables not specified in the model (e.g., parental involvement) may have a simultaneous effect on two or more of the constructs.

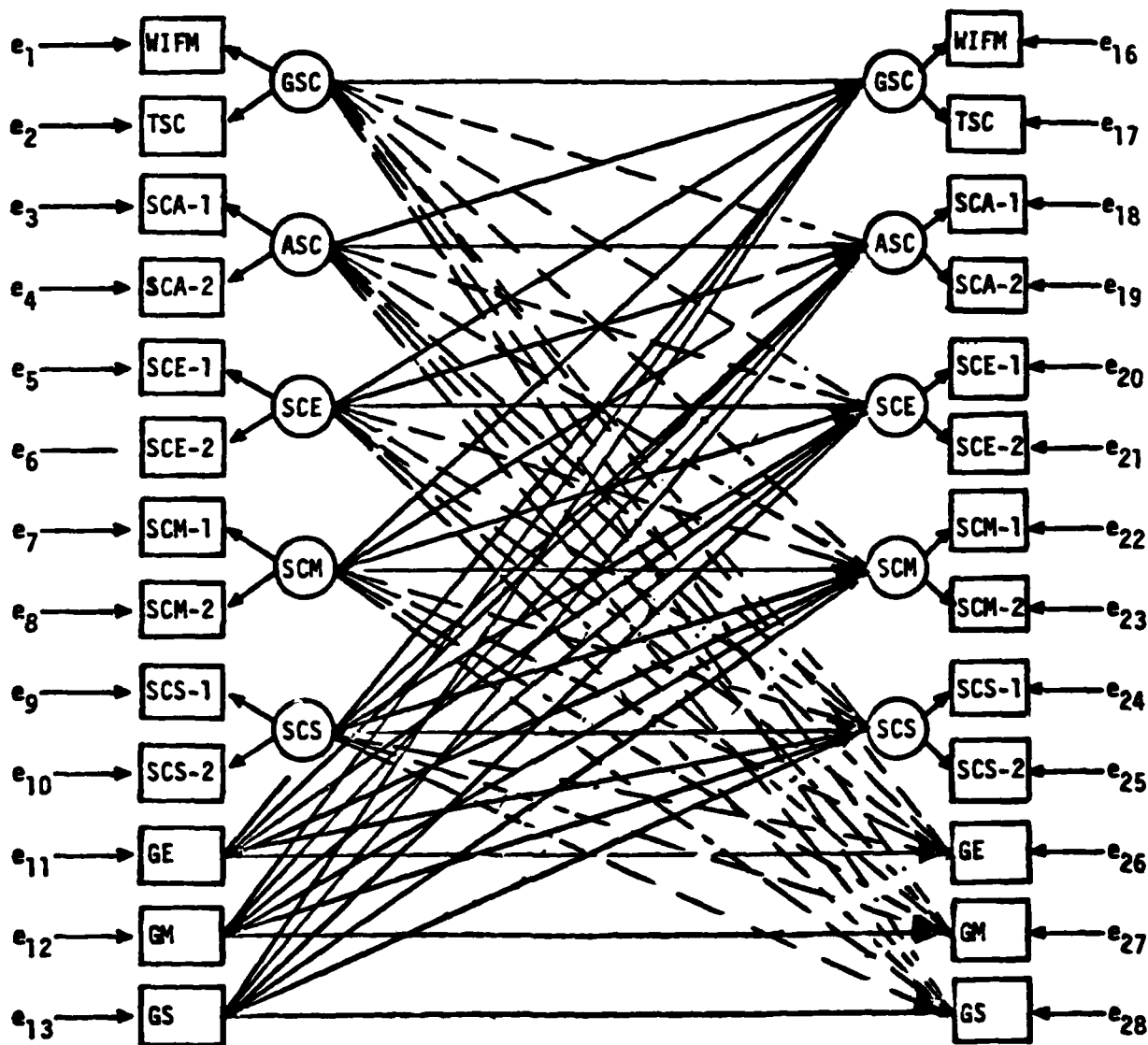


Figure 2

Model of the structure of self-concept and of the predominance of self-concept and achievement. (All proposed correlations between (a) constructs within a time period, e.g., GSC and ASC at time 1; (b) errors of measurement over time, e.g., e_1 and e_{16} ; and (c) disturbance terms of each equation have not been drawn to e_{16} permit clarity.)

↳ GSC=general self-concept (measured by WIFM & TSC); ASC=academic self-concept (measured by SCA-1&2); SCE=self-concept in English (measured by SCE-1&2); SCM=self-concept in math (measured by SCM-1&2); SCS=self-concept in science (measured by SCS-1&2); GE=grades in English; GM=grades in math; GS=grades in science; ABIL=ability (measured by vocabulary and math tests).

Data analysis proceeded sequentially. Subsections of the model were tested before the target model in Fig. 2 was examined.

Hypothesis 1: Hierarchical, Multi-Faceted Nature of Self-Concept

We hypothesized a hierarchical, multi-faceted structure of self-concept. In order to test this hypothesis, a model proposing a single, global self-concept underlying all of the observed self-concept measurements was compared with competing models which posited several, distinguishable but correlated dimensions of self-concept. For example, a single-factor model was tested against the five-factor model of self-concept shown in Fig. 2.

In addition, evidence bearing on a hierarchical model is available from the cross-lagged arrows in Fig. 2. Our theory posits changes in self-concept at higher levels to be a function of changes in self-concept at the lower levels. Hence, coefficients associated with arrows leading from higher to lower levels of self-concept are expected to be zero but not vice versa.

Hypothesis 2: Stability of the Structure of Self-Concept

We hypothesized that the multi-faceted structure of self-concept identified at time 1 would be replicated at time 2. A test of this hypothesis examined (a) the number of constructs present at each time period; and the equality over time, of the (b) factor loadings, (c) variances of and covariances among the latent variables, and (d) reliabilities (error variances) of the observed measures (see Rock, Werts & Flaughner, 1978).

Hypothesis 3: Stability of Self-Concept

We hypothesized that facets of self-concept at higher levels of the hierarchy (see Fig. 1) would be more stable than facets lower in the hierarchy. Assuming the stability of the structure of self-concept (Hypothesis 2), a model positing GSC to be more stable than ASC, and ASC to be more stable than subject-matter self-concepts should provide a better fit to the data than alternative models positing equal stability coefficients or zero stability coefficients.

Hypothesis 4: Discrimination of Achievement and Academic Self-Concept

The interpretation of a distinct area of academic self-concept, especially subject-matter self-concepts, has been challenged by the counterinterpretation that self-reports of academic self-concept are nothing more than students' reports of their grades. A model was set forth stating that grades in each subject matter--math, English, and science--were distinct constructs, correlated with each other and the self-concept constructs in the respective content areas. This model was tested against alternative models in which: (a) grades in the subject-matter areas were hypothesized to measure the same construct as the self-concept in that area; e.g., math GPA and self-concept of math as indicators of a single construct; and (b) grades in the three subject-matters were considered to measure a single achievement construct, distinct from, but correlated with, the self-concept constructs.

Causal Predominance. The study also examined the causal predominance of self-concept and achievement. The model in Fig. 2 (assuming confirmation of Hypotheses 1-4) was tested against alternative models in order to examine causal predominance.

Evaluation of Alternative Models

Covariance structure analysis has traditionally relied on a Chi Square significance test to determine the degree to which a proposed model fits the observed data. However, as Bentler and Bonett (1980, in press) have pointed out, chi square goodness of fit tests are often inadequate for model evaluation since they are contingent upon sample size. One alternative has been to express the adequacy of fit as a ratio of chi square to degrees of freedom (see, for example, Schmitt, 1978). A model of adequate fit will exhibit a ratio somewhere between 1 and 10, the lower the ratio, the better the fit. Tucker and Lewis (1973) have proposed another alternative measure for the degree of fit, ρ . This measure is a type of reliability coefficient which is expressed as a ratio of the amount of covariation explained by the proposed model to the total amount of covariation present in the data. This index compares the null model of complete independence in the data

to competing models. A modification of this index, proposed by Bentler and Bonett (1980), Δ , norms this coefficient so that it lies on a scale of 0 to 1.

For completeness we present each of these goodness to fit indices for each of the models discussed above.

RESULTS AND DISCUSSION

The results of two different statistical analyses are presented here. The first analysis is based on the zero-order correlations among the self-concept measures and grades. No attempt is made to establish causal predominance. Rather, these correlations describe the relationships among variables, the stability of the measures, and patterns of correlations which bear on the structure of self-concept, and on the relation of self-concept and grades. The second analysis is based on an analysis of the structure of covariances among the variables. In this analysis, the hierarchical, multi-faceted features are tested along with hypotheses about stability and causal predominance.

Correlations Among Measures of Self-Concept and Grades

Stability. The stability of each measurement can be estimated by the correlation between scores at time 1 and time 2. For example, scores on the WIFM in February were correlated with scores on the WIFM in June. The results of this analysis are presented in Table 2. As predicted, the measures of general self-concept were the most stable (but see SCE-1). However, contrary to prediction, general academic self-concept was not more stable than subject-matter-specific self-concept. Rather, the stability coefficients were roughly equivalent, on the average. Finally, grades were slightly less stable.

Convergent Validity. The convergent validity of the self-concept measures can be examined by correlating one measure (say) of general self-concept (e.g., WIFM) with the other measures of GSC (e.g., TSC). Since GSC was measured at two points in time, convergent validity can be estimated at time 1 and 2. The convergent validities should be

Table 2
Stability Coefficients^a
(over 6 months)

| Measure | Stability Coefficient |
|---|-----------------------|
| <u>General Self-concept</u> | |
| Piers-Harris (WIFM) | .81 |
| Tennessee (TSC) | .83 |
| <u>Academic Self-concept^b</u> (Brookover, Form A) | |
| SCA-1 | .66 |
| SCA-2 | .69 |
| <u>Subject-matter Self-concept^b</u> (Brookover, Form B) | |
| SCE-1 | .81 |
| SCE-2 | .68 |
| SCM-1 | .70 |
| SCM-2 | .56 |
| SCS-1 | .76 |
| SCS-2 | .74 |
| <u>Grades</u> | |
| English | .60 |
| Math | .48 |
| Science | .68 |

^a Zero order correlations

^b 1 and 2 denote halves of the Brookover instruments

statistically significant (i.e., greater than zero) and of practical value. The results of this analysis are reported in Table 3. Clearly, the criterion of convergent validity was met by each measure (r's range from .70 to .83).

Discriminant Validity. Finally, the discriminant validity of the self-concept measures can be examined by comparing the correlation between two measures of the same construct (e.g., WIFM and TSC) with the correlation between (say) WIFM and academic self-concept or grades in English. The correlation between two measures of the same construct should be greater than the correlation between measures of different constructs. Furthermore, based on the hierarchical nature of self-concept, the correlation between English self-concept and grades in English, for example, should be higher than the correlation between GSC and grades in English.

Correlations bearing on the discriminant validity of the self-concept measures and the hierarchical nature of self-concept are presented in Table 4. In creating the table, the correlations between multiple indicators of two constructs--e.g., r_{WIFM,SCA_1} ; r_{WIFM,SCA_2} ; r_{TSC,SCA_1} ; r_{TSC,SCA_2} --were averaged (i.e., means) by transforming all correlations to Fisher's Z's, averaging the Z's, and then transforming the average Z to a correlation.

In general, discriminant validity can be readily ascertained by comparing the convergent validities in the boxes along the main diagonal with the correlations in their corresponding rows and columns. For example, the convergent validity coefficient for GSC (.77) can be compared with the correlations in row 1 and those in column 1. Clearly, .77 is greater than any other coefficient and so the hypothesis of discriminant validity is supported. Likewise, for all other constructs, the criterion of discriminant validity was met. This finding lends support to the multi-faceted interpretation of self-concept.

Finally, support for the hierarchical nature of self-concept is evident in Table 4. General self-concept should correlate highest with academic self-concept, next highest with subject-matter-specific self-concept, and lowest with grades. This was exactly what happened at

Table 3
Convergent Validity Coefficients*

| Construct | Time 1 | Time 2 |
|--------------------------------------|---------------|---------------|
| General Self-concept | .80 | .73 |
| General Academic Self-concept | .76 | .70 |
| English Self-concept | .82 | .79 |
| Math Self-concept | .71 | .80 |
| Science Self-concept | .80 | .83 |

* $r = .26$ is statistically significant at $\alpha = .01$ ($n = 99$).

Table 4
Discriminant Validities of Self-concept Measures^a

| | Time 1 | | | | | | | | | |
|----------|--------------------|-----|------------------|------|------|-----|-----|------|--|--|
| | GSC | SCA | SCAE | SCAM | SCAS | GE | GM | GS | | |
| T | .77 ^{b,c} | .38 | .28 | .21 | .26 | .11 | .12 | .10 | | |
| I | .38 | .73 | .55 | .41 | .63 | .38 | .34 | .40 | | |
| M | .30 | .63 | .80 | .30 | .54 | .56 | .23 | .24 | | |
| E | .27 | .62 | .43 | .76 | .33 | .17 | .31 | -.05 | | |
| | .30 | .71 | .45 | .53 | .82 | .27 | .22 | .47 | | |
| | .16 | .37 | .48 ^d | .09 | .28 | - | .52 | .51 | | |
| | -.02 | .34 | .27 | .37 | .31 | .59 | - | .59 | | |
| | .12 | .37 | .23 | .17 | .43 | .64 | .55 | - | | |

^a Average correlation over multiple indicators of each construct using Fisher's Z transformation

^b Box indicates convergent validity coefficient-average using Fisher's Z transformation.

^c $r = .26$ statistically significant at $\alpha = .05$; ($n = 99$).

^d Circle indicates the correlation between subject-matter self-concept and grade in that subject matter

time 1 (row 1) and was replicated at time 2 (column 1). General academic self-concept should correlate higher with subject-matter-specific self-concept than with grades. This was the case at time 1 (row 2) and was replicated at time 2 (column 2). And subject-matter-specific self-concept (e.g., in English) should be correlated higher with grades in that subject matter (in English) than with grades in other subject-matters (circles in Table 4). Again, the data at time 1 confirmed this expectation and were replicated at time 2.

In sum, the correlations among the self-concept measures and grades support a hierarchical, multi-faceted interpretation of self-concept. However, since these pairwise correlations do not take into account other variables in the model (see Fig. 2), they must be interpreted cautiously. The next analysis takes multiple variables into account whereby interpretation of relationships becomes less hazardous.

Analysis of Covariance Structures

Hierarchical, Multi-Faceted Structure of Self-Concept. Figure 1 suggests that the structure of self-concept is multi-faceted and hierarchical. Three structural models tested this hypothesis. Model 3 posited a completely differentiated structure with correlated facets as shown in Fig. 2. Models 1 and 2 represented competing models which were more restrictive and less differentiated than Model 3. Model 1, a single factor model, posited a single, general self-concept measured by all of the manifest self-concept variables. Model 2 posited a two-factor model, with general self-concept (measured by the WIFM and TSC) and academic self-concept (measured by the remaining indicators of self-concept) correlated.

Measures of the goodness of fit of each model to the data collected at time 1 are presented in Table 5. These data indicate that Model 3--the most differentiated model of self-concept--provided the best fit to the data. Whereas Models 1 and 2 accounted for only 39 and 53 percent of the covariation in the data ($\rho = .51$ and $.62$, respectively), the full multi-faceted model accounted for 80 percent of the covariation ($\rho = .86$). The chi square ratio test, as expected, led to a similar conclusion. For model 1, the ratio of a chi square to its

Table 5
Tests of the Hierarchical, Multifaceted Structure
of Self-concept

| Competing Models | Time 1 | | | Time 2 | | | | |
|---|----------|----|-------------|----------|----------|----|-------------|----------|
| | χ^2 | df | χ^2/df | Δ | χ^2 | df | χ^2/df | Δ |
| 0 Null Model (Complete independence/ total covariation) | 718.84 | 45 | 15.97 | — | 791.54 | 45 | 17.58 | — |
| 1 General Self- concept (single factor model) | 354.42 | 35 | 10.10 | .39 | 352.90 | 35 | 10.08 | .45 |
| 2 General and Academic Self-concept (two factor model) | 272.50 | 34 | 8.01 | .53 | 272.90 | 34 | 8.02 | .58 |
| 3 General, Academic and Subject-matter Self-concepts (five factor model) | 98.80 | 25 | 3.95 | .80 | 116.40 | 25 | 4.65 | .78 |
| | | | | | | | | .85 |

degrees of freedom exceeded 10, indicating a poor fit. Moreover, this ratio is more than twice as large for Model 2 as for Model 3. Finally, these findings were replicated at time 2 (see Table 5).

Stability of the Structure of Self-Concept

While the results of the confirmatory factor analysis at time 1 were replicated at time 2 (see Table 5), a more stringent test of the stability of the structure of self-concept was conducted by examining the equivalence of factor loadings, variances of and covariances among factors (facets, latent variables), and error variances at the two points in time. Five models were tested, ranging from a model with all parameters unconstrained to a model with all parameters at time 2 constrained to equal their counterparts at time 1. The last model (Model 5) provided the best fit to the data (see Table 6) and the most parsimonious interpretation, viz., equivalence of factor structures at times 1 and 2. Model 5 accounted for 64 percent of the covariance ($\rho = .61$) while the chi square to degrees of freedom ratio was the lowest among models, 4.56. In contrast, the model with all parameters unconstrained accounted for 57 percent of the covariance with a χ^2/df ratio of 5.32. Finally, given the similarity of the goodness of fit among the models restricting one, some, or all of the parameters to equivalence, the most parsimonious model--complete equivalence--is preferred.

Discrimination of Academic Self-Concept from Academic Achievement

In order to validate interpretations of test scores as measuring a construct, it is not sufficient to demonstrate a self-concept structure consistent with theory. It is also necessary to show that measures of the proposed construct can be discriminated from measures of other constructs (cf. Shavelson et al., 1976). This is clearly the case with measures of academic self-concept, especially matter self-concepts, since they are tied so closely to academic achievement. A counterinterpretation to the proposed interpretation of measures of academic self-concept is that ASC is nothing more than a student's report of his grades, achievement test scores, or some combination of the two.

Table 6

Test of the Stability of the Structure
of Self-concept over Time

| Competing Models | χ^2 | df | χ^2/df | gpc | Δ |
|--|----------|-----|-------------|-----|----------|
| 0 Null Model | 2087.66 | 190 | 10.99 | — | — |
| 1 Parameters Completely Free | 798.00 | 150 | 5.32 | .57 | .62 |
| 2 Factor Loadings Equivalent | 799.10 | 155 | 5.10 | .60 | .62 |
| 3 Factor Loadings and Latent Variable Variances Equivalent | 801.66 | 160 | 5.01 | .60 | .62 |
| 4 Factor Loadings, Latent Variable Variances and Covariances Equivalent | 810.74 | 170 | 4.77 | .62 | .61 |
| 5 Factor Loadings, Latent Variable Variances and Covariances, and Error Variances Equivalent | 820.56 | 180 | 4.56 | .64 | .61 |

In order to examine this counterinterpretation to the proposed interpretation of ASC--viz., ASC measures self-concept and not achievement--a series of competing models were tested as to their fit of the data. Model 1 asserted that grades in a subject-matter (e.g., English) and self-concept in the same subject-matter (i.e., English) were simply two indicators of the same construct, achievement in the subject-matter (i.e., English). Model 2 asserted that grades in school subjects were indicators of a separate achievement construct, and this achievement construct is correlated with a construct of subject-matter self-concept represented by SCE, SCM, and SCS. Finally, the third model posited separate subject-matter achievement constructs and subject-matter self-concept constructs (i.e., in English, math, and science). For Model 3, achievement and self-concept in one subject-matter should be discriminated from each other and from achievement and self-concept in another subject-matter. The statistics bearing on the goodness of fit of each of these models are presented in Table 7.

Perhaps the most critical test of the interpretation of academic self-concept as distinct from achievement is a comparison of Model 1--positing academic self-concept and achievement as a single construct--with Model 3--positing highly differentiated interpretations of achievement and self-concept constructs, i.e., in specific subject-matters. Clearly Model 3 provided a better fit to the data at time 1 than does Model 1, and this finding was replicated at time 2. For example, at time 1, Model 3 accounts for 82 percent of the covariation ($\rho = .87$; $\chi^2/df = 2.94$) while Model 1 accounts for only 65 percent ($\rho = .71$; $\chi^2/df = 4.75$). Furthermore, a comparison of Model 3 with Model 2--positing an achievement construct and academic self-concept construct, but not at the level of specific subject-matters--permits us to decide whether grades are multiple indicators of a general achievement construct or whether they indicate separate but correlated achievement constructs; likewise for measures of subject-matter self-concepts, are they indicators of different but correlated constructs or of one general, academic self-concept construct? From the statistics presented in Table 8, Model 3 provided a better fit to the data than Model 2. Achievement and academic self-concept deserve separate interpretations at the level of specific subject-matters.

Table

Tests of the Discriminability of Self-Concept and Academic Achievement

| Competing Models | Time 1 | | | | Time 2 | | | | | |
|--|----------|----|-------------|--------|----------|----------|----|-------------|--------|----------|
| | χ^2 | df | χ^2/df | ρ | Δ | χ^2 | df | χ^2/df | ρ | Δ |
| 0 Null Model (Complete independence/ total covariation) | 910.73 | 78 | 11.68 | - | - | 994.31 | 78 | 12.75 | - | - |
| 1 Achievement and Academic Self-concept Indicators of Achievement | 228.78 | 55 | 4.16 | .71 | .75 | 261.56 | 55 | 4.75 | .68 | .74 |
| 2 Achievement and Academic Self-concept Separate but Correlated Constructs | 190.81 | 50 | 3.82 | .74 | .79 | 192.76 | 50 | 3.86 | .76 | .81 |
| 3 Subject-matter Achievement and Subject-matter Self-concepts are Separate but Correlated Constructs | 117.79 | 40 | 2.94 | .82 | .87 | 143.05 | 40 | 3.58 | .78 | .86 |

Causal Predominance of Self-Concept and Achievement

Neither self-concept theory nor prior research has clearly established the causal predominance of self-concept over achievement or vice versa. As a consequence, a series of structural models were developed in order to test competing causal explanations.

The set of models used in this analysis were crosslagged panel models similar to Fig. 2, except that each subject-matter self-concept (e.g., SCE) and grade (GE) combination were examined in (three) separate models. For example, the model for English included the constructs of GSC, ASC, SCE, and GE at time 2 as a function of all of these constructs as measured at time 1. These crosslagged models (see Fig. 2) simultaneously examined competing causal explanations: (a) achievement (grades) at time 1 causes changes in self-concept at time 2; (b) self-concept causes achievement--arrows from the self-concept constructs at time 1 to grades at time 2; and (c) subject-matter self-concept (as posited by theory) is the causal agent or object of cause rather than ASC or GSC.

The models in each subject matter were examined in a similar manner. First, a fully saturated model was posited. This model allowed for the estimation of all possible parameters including the full set of cross-lagging regression coefficients. Parameters were then systematically eliminated if they could not be statistically differentiated from 0 ($p < .05$), and if their deletion from the model did not significantly deteriorate a fit to the covariance structure of the data (based on a chi square difference test). Only the final models from each subject matter, representing the best-fitting, most parsimonious representation of the data are presented here. Further, only the structural coefficients relating to the causal predominance of self-concept and achievement are discussed.

English. The final model of the causal relation between self-concept and grades in English provided an excellent fit to the data, accounting for 94% of the covariation ($\chi^2/df = 1.07$, $p = .994$). It included all four stability paths (cf. the horizontal paths between constructs in Fig. 2). The stability coefficients for GSC, ASC, SCE, and GE were .902, .791, .852, and .461, respectively. The model also

included two crosslagged, causal paths, one from ASC to GE and the other from GE to GSC, indicating the causal predominance of self-concept over achievement. Specifically, the structural coefficient for the path from ASC to GE was .301, while the structural coefficient for the path from GE to GSC was -.106.

Several aspects of these findings are noteworthy. First, the hierarchical model of self-concept predicted that the causal link between self-concept and achievement would more likely be between SCE and GE rather than between ASC and GE. One possible explanation for this finding is that the latent constructs of ASC and SCE were moderately correlated at time 1 (.52, see Table 9) and both these constructs correlated equally with GE (.34). While a distinction between ASC and SCE could be drawn in the data, clearly both are closely related by virtue of achievement, and so in this sample, the path from ASC to GE was retained. In a second sample, just the reverse might occur.

The second noteworthy finding was that the causal path from GE went to GSC and not to SCE or ASC. Moreover, the structural coefficient was slightly negative suggesting that higher grades in February were associated with lower general self-concept in June. It should be pointed out that there is evidence in the literature suggesting that GSC is comprised of academic and non-academic components (Shavelson et al., 1976). The negative relation between general self-concept and grades is probably due, then, to the non-academic facets of general self-concept, such as social self-concept. But to go beyond this explanation would be only to speculate.

Mathematics. The final model of the causal relation between self-concept and grades in science provided an excellent fit to the data, accounting for 92% of the covariation ($\chi^2/df = 1.27$, $p = .975$). It included all four stability paths. The stability coefficients for GSC, ASC, SCM, and GM were .889, .772, .747, and .400, respectively. The model also included two crosslagged, causal paths, one from SCM to GM and the other from GSC to GM, indicating the causal predominance of self-concept over achievement. Specifically, the structural coefficient for the path from SCM to GE was .329, while the structural

coefficient for the path from GSC to GE was $-.208$. Like the data on English grades, there was a negative relation between GSC and GM; unlike the English data, the causal direction was from general self-concept to grades.

Science. The final model of the causal relation between self-concept and grades in science provided an excellent fit to the data, accounting for 93% of the covariation ($\chi^2/df = 1.21$, $\rho = .983$). It included stability paths for GSC, ASC, SCS, and GS--.892, .604, .867, .625, respectively. The model also included two crosslagged causal paths, one from ASC to GS and the other from SCS to ASC. The former path indicates the causal predominance of self-concept over achievement. Specifically, the structural coefficient for the path from ASC to GS was .168, while the structural coefficient for the path from SCS to ASC was .25. Like the data from English, ASC and not SCS was causally related to GE. The same explanation as the one given for the English data probably applies here (e.g., the correlation between ASC and SCS was .73, see Table 8).

Additional Evidence on the Hierarchical Structure

Correlations among the latent self-concept constructs and the observed grades (not shown in detail in Fig. 2 in order to make the figure legible) also bear on the hierarchical structure of self-concept, although they do not bear on the causal direction in the hierarchy. In particular, a hierarchical structure should produce a pattern of correlations such that GSC correlates higher with ASC, next with subject-matter self-concepts, and least with grades; ASC should correlate higher with subject-matter self-concepts than with grades; and subject-matter self-concepts should correlate higher with their corresponding grades than with grades in different subject-matters. Table 8 contains the correlations bearing on these hypotheses.

The predicted pattern of correlations is observed in Table 8, lending support to the hierarchical, multi-faceted structure of self-concept. For example, the correlation between GSC and ASC is .48 and the correlations between GSC and Subject-matter self-concepts range from .26 to

.34. The correlations between ASC and subject-matter self-concepts (row 2 of Table 8) are almost twice as high as the correlations between ASC and grades. Finally, the correlations between subject-matter self-concepts and their corresponding grades (ranging from .34 to .59) are higher than the correlations between subject-matter self-concepts and grades in other subject-matters (ranging from -.05 to .28).

Table 8

Correlations among Latent Self-Concept Constructs
and Grades at Time 1

| | GSC | GSC | SCE | SCM | SCS | GE | GM | GS |
|-----|-----|-----|-----|-----|------------------|------------------|-----|-------------------|
| GSC | - | .48 | .26 | .34 | .30 | .14 | .12 | .11 |
| SCA | | - | .52 | .62 | .73 | .34 | .37 | .41 |
| SCE | | | - | .33 | .38 ^b | .34 ^d | .17 | -.05 ^c |
| SCM | | | | - | .58 | .24 | .59 | .25 |
| SCS | | | | | - | .25 | .28 | .49 |
| GE | | | | | | - | .52 | .59 ^e |
| GM | | | | | | | - | .51 |
| GS | | | | | | | | - |

a Correlations between latent academic self-concept trait (facet) and latent subject-matter specific self-concept traits (facets)

b Correlations among latent subject-matter specific self-concept traits (facets)

c Correlations among latent subject-matter specific self-concept traits (facets) and observed grades

d Correlations between latent subject-matter specific self-concept traits (facets) and their corresponding observed grades

e Correlations among observed grades

SUMMARY AND CONCLUSIONS

↓

The purposes of this paper were to advance self-concept theory and to present recent methodological advances for doing so. With respect to methodology, the analyses of covariance structure, compared to simply an analysis of correlations, enabled us to test competing models and to understand the origin of the observed correlations. The conclusions that would have been drawn from the correlational data--e.g., multi-faceted, hierarchical structure with increasing stability of constructs toward the apex--were modified and clarified on the basis of the analysis of covariance structure--e.g., lack of support for increasing stability. The covariance structure analytic technique also permitted us to test causal relations between latent constructs rather than between observed variables. Causal relationships among constructs, of course, cannot be tested on the basis of zero-order correlations. Clearly the covariance structure technique is a major methodological contribution to the development and testing of psychological theory in education.

With respect to self-concept theory, the following conclusions seem warranted on the basis of our sample of 99 middle-class, junior high students and the literature reviewed. Self-concept is a multi-faceted construct. General self-concept can be interpreted as distinct, but correlated with academic self-concept. Furthermore, subject-matter-specific facets of self-concept can be interpreted as distinct, but correlated with one another and with academic and general self-concept. Further research is needed to determine whether the multi-faceted structure posited in Fig. 1 holds for other areas of self-concept (e.g., social, physical) as suggested by theory and past research.

Self-concept is a hierarchical construct with general self-concept at the apex and the situation-specific self-concepts (at least as low in the hierarchy as subject-matter-specific self-concepts, see Fig. 1) at the base. However, two aspects of this hierarchy remain unconfirmed. First, our data did not support the assumption that facets of self-concept become increasingly stable toward the apex of the hierarchy. Rather, the facets observed in this study were equally very stable.

One possible explanation for this finding is that the lowest levels of the hierarchy in Fig. 1, the levels predicted to be least stable, were not measured in this study. Another possible explanation is that the six-month time period was not long enough to identify differences in stabilities. Second, our data did not support the interpretation that changes in self-concept operate from the base of the hierarchy upward. Rather an upward operating model could not be distinguished from a downward operating model. Again, our data did not provide the strongest possible test of this feature of self-concept.

Self-concept can be distinguished from academic achievement. The relationship between grades and subject-matter self-concept is stronger than the relationship between grades and academic self-concept. Furthermore, models which distinguish grades and corresponding subject-matter self-concept constructs accounted for more covariation than did models combining grades in different subject-matters with their corresponding subject-matter self-concepts.

Finally, the results of this study pointed to the causal predominance of self-concept over achievement. This finding was replicated in the three school subject areas. The size and nature of the sample used in this study, however, warrants only a tentative generalization of these results.

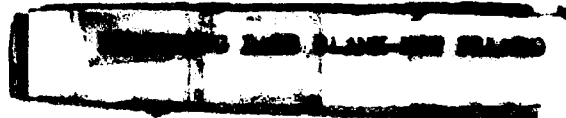
Further studies with larger samples might take into account a qualitatively more diverse population. These studies might also include additional variables such as peer and parental influence as either causal or moderating variables in the linkage between self-concept and achievement.

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