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Looking Outside and Inside: Self-Concept Development of Gifted Adolescents

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ABSTRACT: *The internal/external frame of reference model (Marsh, 1986) was proposed to explain the development of academic self-concepts for general ability samples. Recent research calls into question the model's applicability for gifted adolescents' academic self-concept development. This model was examined for 131 adolescents participating in a summer program for academically talented students. Results suggest that the model is useful in understanding the academic self-concept development of students who are gifted, with no significant differences among students with demonstrable strengths in mathematics, verbal areas, or both areas. Educators should be aware that exceptional performance in one area, such as mathematics, will probably have a positive impact in mathematics self-concept but a negative impact on other academic self-concepts, such as verbal self-concept.*

Researchers and practitioners working with children are becoming increasingly aware of the role of affective processes in students' intellectual development. For example, investigators have examined the significance of positive attachments, anxiety and task performance, and classroom and family climate for healthy adolescent development (Cotterell, 1992; Henry, Moffitt, Silva, & McGee, 1991; Nelson, 1984). This accent on affect has also become increasingly prevalent within the fields of gifted education and talent development. Recent investigations have explored psychological adjustment, the psychological and behavioral consequences of lack of challenge in school, depression and self-esteem, and stress and coping (Brody & Benbow, 1986; Gallagher, Harradine, & Coleman, 1997; Luthar, Zigler, & Goldstein, 1992; Plucker, 1998; Plucker & McIntire, 1996). The need for considering affective issues related to the development of youth who are gifted is apparent in the growth of groups and organizations devoted to this cause (e.g., the Social and Emotional Needs of the Gifted organization), as well as current educational and counseling efforts (e.g., Nail & Evans, 1997; Reis, 1995).

Researchers have called for more systematic work in this area with appropriate instrumentation (Cornell, 1994; Hoge & Renzulli, 1993). For example, models of self-concept development among students who are gifted are rarely examined, with a majority of self-concept work focusing on measurement and validity studies. In order to better understand the intellectual and affective growth of gifted students, researchers need to create and evaluate models of self-concept development that incorporate the role of affective variables in academic and intellectual development.

SELF-CONCEPT AND ADOLESCENT WELL-BEING

Among the affective constructs that have been targeted as important to adolescent well-being, few have received greater attention than self-concept. Self-concept is, at the most simplistic level, an idea or set of ideas one has about oneself. During adolescence, the self-concept becomes more abstract and differentiated, enabling complex forms of self-representation to take shape (Erikson, 1968; Harter, 1986). Current theorists (e.g., Byrne & Shavelson, 1996; Harter, 1982; Marsh & Shavelson, 1985) suggest that an individual has distinct views of self within various areas, including general self-concept (e.g., self-worth, self-esteem, global self-concept) and more specific social/relational and scholastic/academic self-concepts. Academic self-concept is important for understanding a variety of school-related constructs, including educational and occupational aspirations (Marsh, 1991) and school achievement (Hoge & Renzulli, 1993).

Models of self-concept are generally considered to be either unidimensional or multidimensional in nature, with additional classifications within each major category (Byrne, 1996; Strein, 1993). Researchers in the multidimensional tradition have differentiated general "academic self-concept" into mathematics and verbal self-concepts along with a general "school" category (Byrne & Worth Gavin, 1996; Marsh & Yeung, 1988). These components are often arranged in a hierarchical fashion, with general self-concept at the apex of the model. Math and verbal self-concepts have been linked to achievement in school and on relevant tests; students who feel better about their math or verbal ability tend to demonstrate higher achievement in the corresponding subject area (Marsh, Parker, & Barnes, 1985; Marsh & Yeung, 1998).

GIFTED ADOLESCENTS' SELF-CONCEPT

The academic self-concept of children who are gifted has been addressed in a variety of ways and toward a number of different ends (Dixon, 1998), usually using the *general* academic/scholastic self-concept rather than the *subject-specific* constructs. Students who are gifted tend to have positive general academic and social self-concepts, higher than those of nongifted comparison groups (see Hoge & Renzulli, 1993; Janos & Robinson, 1985; Ross & Parker, 1980). General academic self-concept has been positively linked to achievement for gifted students (Kelly & Jordan, 1990; Van Boxtel & Monks, 1992) and classroom peer status for adolescent girls who are gifted in a summer enrichment program (Cooley, Cornell, & Lee, 1991; Cornell et al., 1990). Furthermore, academic self-concept may shed light on negative academic outcomes like the underachievement of gifted children (Ross & Parker, 1980).

Fewer investigators have examined the specific math and verbal self-concepts of students who are gifted. Such work indicates that gifted students tend to have more positive feelings about their competence in math and verbal domains than nongifted students (Brounstein, Holahan, & Dreyden, 1991; Norman, Ramsay, Martray, & Roberts, 1999; Pajares & Graham, 1999). However, the association of achievement in an academic area and related self-concept

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does not appear to be clear cut (Hoge & Renzulli, 1993). For example, a student with strong mathematical and verbal achievement will not necessarily have high mathematics and verbal self-concepts. Since no models exist for explaining the relationship between gifted students' achievement and academic self-concept, further investigation of subject-specific self-concepts of students who are gifted is warranted (Williams & Montgomery, 1995).

DEVELOPMENT OF ACADEMIC SELF-CONCEPT

Given the significance of the academic self-concept, the enhancement of self-concept outcomes is of concern to educators, practitioners, and program developers. Before systematic attempts can be made to create environments or programs that foster positive academic self-concept, careful analysis of developmental theories of self-concept must be undertaken. Marsh and colleagues (Marsh, 1986; Marsh et al., 1988) proposed the internal/external frame of reference model (I/E model) to delineate processes that result in the formation of self-concepts in particular academic domains (Figure 1; see Bong, 1998, Williams & Montgomery, 1995, and Skaalvik & Rankin, 1990, 1992, for other treatments of this model).

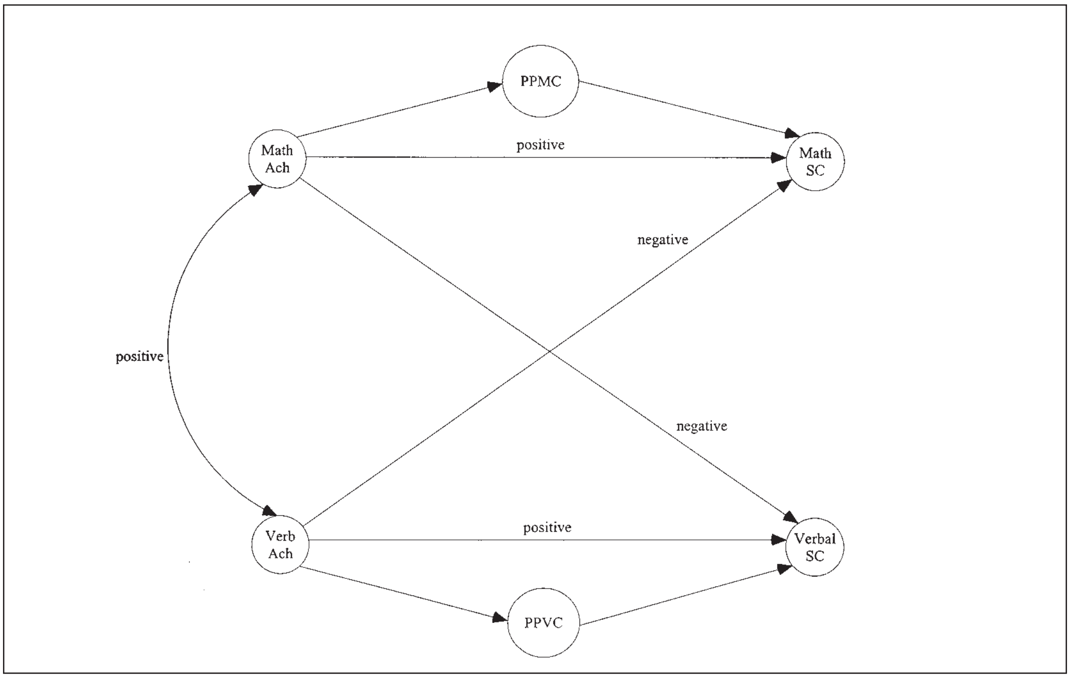
According to this model, students base their self-concept on two simultaneous comparison processes. The *internal* comparison (or "frame of reference") includes an individual student's appraisal of her ability in one academic domain (e.g., math) in comparison to her ability in other academic areas. The *external* comparison is the student's evaluation of competence in that academic domain relative to the perceived ability of peers. This social comparison reflects the notion that peer groups provide important information about relative standing in a given domain (e.g., Festinger, 1954; Marsh, 1984; Marsh & Parker, 1984; Marsh, Smith, & Barnes, 1985; Marsh, Chessor, Craven, & Roche, 1995; Renick & Harter, 1989; Skaalvik & Rankin, 1990). Therefore, a student's self-concept in mathematics is derived from her perceived math competence relative to competence in other subjects as well as from an evaluation of math competence relative to that of her peers.

The I/E model hypothesizes that achievement in one area has a direct positive effect on similar-domain self-concept (due to the external comparisons) and a negative effect on the self-concept in the other domain (due to the internal comparisons). For example, a student's verbal achievement would have a strong positive impact on her verbal self-concept and a moderate negative impact on her math self-concept; a student with high verbal performance is expected to feel good about herself in terms of verbal ability but less positive about herself in terms of math. In essence, the effects of the external and internal comparisons largely cancel each other out. As a result, a student's math self-concept development may appear to be unrelated to her verbal self-concept, although she may have very similar mathematics and verbal achievement.

Some aspects of frame of reference models have been examined for students who are gifted. For example, a number of investigators have discussed the negative effect of comparison processes on the academic self-concept of students participating in gifted programs. Because intense, highly challenging coursework and close exposure to similarly talented peers are hallmarks of programs designed to serve gifted populations (Olszewski-Kubilius, 1997; Stocking, 1998), students who are gifted frequently suffer a decrease in their perceived academic competence when first enrolled in such programs (Marsh et al., 1995; Olszewski, Kulieke, & Willis, 1987; Richardson & Benbow, 1990; Swiatek & Benbow, 1991); they feel less positive about their academic ability when they realize there are so many *other* bright young people. Furthermore, Skaalvik and Rankin (1992) evaluated the I/E model and found that this model worked well *except* for students who perceived

Figure 1

Internal/External Frame of Reference Model Proposed by Marsh (1986).



Note: Math Ach = Mathematics Achievement; Verbal Ach = Verbal Achievement; Math SC = Math Self-concept; Verbal SC = Verbal self-concept; Math Ach—Math SC and Verbal Ach—Verbal SC paths represent external comparisons, while Verbal Ach—Math SC and Math Ach—Verbal SC paths represent internal comparisons.

their math and verbal achievement to be similar, which may be the case for students who may manifest high performance in a number of academic pursuits.

Williams and Montgomery (1995) used the I/E model to examine the academic self-concepts of 103 high school honors students enrolled in an honors science program. While in their science classes, participants completed an instrument adapted from the ME: Self-Concept Scale for Gifted Children (Feldhusen & Kolloff, 1981) to measure math and language self-concept; students' prior Iowa Test of Basic Skills (ITBS) scores served to indicate subject-specific achievement. The model was not disconfirmed by the findings; math and verbal achievement were strongly related, while math and verbal self-concepts were not related. Furthermore, subject-specific achievement had the predicted strong positive effect on the corresponding self-concept domain (evidence for an external frame of reference) and a weaker negative effect on the other self-concept domain (support for an internal frame of reference). The investigators concluded that academically able students used both internal and external comparisons in determining their math and verbal self-concepts.

In summary, some evidence has been garnered that the I/E model is appropriate for the development of gifted students' math and verbal self-concepts. However, a number of questions remain unanswered. For example, Williams and Montgomery (1995) studied honors students participating in science classes; how would this model work for students identified as gifted under more stringent, standardized criteria? Would this model be equally appropriate for students highly talented in a specific domain (i.e., math or verbal) as it would those talented in several content areas? Would this model adequately describe the development of math and verbal self-concepts for gifted students participating in challenging, extracurricular academic programs, given the literature on academic self-concept in such programs? This article addresses these questions.

METHOD

Participants

Study participants included 131 (43% female, 57% male) rising 8th to 10th grade students enrolled in a summer residential program, an intensive 3-week academic experience, during the summer of 1995. Seventh grade students in the program's region of the country scoring at or above the 97th percentile on their school-administered achievement test were invited to participate in the Talent Search, which ensures 4 years of informational and motivational resources, as well as an invitation to take the SAT or ACT out-of-level. The talent search method has historically provided a useful, efficient means of identifying students of very high ability in one or more scholastic domains (Lupkowski-Shoplik & Swiatek, 1999; Olszewski-Kubilius, 1998). Students become eligible for the summer residential programs by achieving specific SAT (or ACT) score criteria; for example, 7th grade students testing in 1995 needed to achieve 550 or higher on the math portion of the SAT to gain entrance into an algebra class. Students in the sample ranged from 12 to 16 years of age, with an average age of 14.0. Approximately 73% of the students were Caucasian, 14% Asian American, 5% African American, 5% Hispanic, and 3% reported their ethnicity as "other" or chose not to provide demographic information.

Instrumentation

Participants completed the *Self-Description Questionnaire II* (SDQII; Marsh, 1992), a widely-used measure of adolescent self-concept (Byrne, 1996). The SDQII includes 102 items indicating levels of self-concept in 11 dimensions; this study employs only scores representing math self-concept (e.g., "Mathematics is one of my best subjects") and verbal self concept (e.g., "Work in English classes is easy for me"). Item responses are on a 6-point Likert-type scale (1 = false to 6 = true); half the items are reverse-coded. Plucker, Taylor, Callahan, & Tomchin (1997) found sufficient evidence of reliability and validity for gifted adolescents' SDQII scale scores for use in group research settings. Math and verbal achievement were indicated by scores obtained on the SAT taken out-of-level no more than 2 years prior to completion of the SDQII, as is standard for Talent Search-based programs (Olszewski-Kubilius, 1998).

Analysis

Basic model. Marsh's (1986) internal/external frame of reference model was fit to students' math and verbal SAT scores and math and verbal SDQII scale scores using structural equation modeling. Since the unobserved achievement variables are each represented in the model by one observed variable, the variances of the observed achievement variables were fixed to represent appropriate reliability estimates. In general, model fit can often be improved by adding correlations between uniquenesses, or error terms, in the model. With this in mind, four models were tested: (a) the default null model, in which no relationships were posited among the observed variables; (b) model 1.0, the I/E model as proposed by Marsh (1986) with no correlated uniquenesses (i.e., error terms); (c) model 1.1, with correlated uniquenesses between the two self-concept latent variables (i.e., hypothesizing that math and verbal self-concept have common sources of unexplained variance); and (d) model 1.2, which included two additional correlated uniquenesses/error terms among the measured self-concept variables. From a practical standpoint, the three versions of the model are structurally similar in most practically important ways. Their only variation is found in the way that the models explain correlations among error terms, which is common in structural equation modeling.

Multigroup comparisons. In order to investigate the applicability to adolescents who are gifted of Skaalvik and Rankin's (1992) findings regarding similarity in perceived competence, the second phase of the analyses involved splitting the sample into three groups: (a) students scoring above 570 on the SAT math test and 500 or higher on the SAT verbal test (n = 30, 23%); (b) students scoring 500 or above on the math test and below 500 on the verbal test (n = 65, 50%); (c) and students scoring 500 or higher on the verbal test and below 580 on the math test (n = 36, 28%). These classifications allowed us to test whether specific parameters were equivalent across students with high math *and* verbal skills, with a relative strength in math, and with relative verbal strengths (i.e., multiple potentialities vs. specific strength areas). The invariance of these models was tested across the three groups using multigroup structural equation modeling.

RESULTS

Descriptive Statistics

Reliability estimates were acceptable for the purposes of this study (math alpha = .89, verbal alpha = .89) and were similar to those observed by Plucker et al. (1997) with another sample of talented young adolescents. Additional descriptive statistics are presented in Table 1. The present sample had higher means on the math and verbal self-concept than the Plucker et al. sample, which may be due to the more specific identification criteria of the present sample: Students in the present sample were identified solely by their test scores, while the Plucker et al. sample was chosen with additional criteria, such as personal essays, teacher recommendations, and grades.

Basic Model

Table 2 contains the results of the initial model testing. The degree to which a model works to explain a given set of data is indicated by goodness-of-fit statistics. Although guidelines for interpreting fit statistics vary, several statisticians recommend that a variety of indicators be used. In this study, we used the chi square of each model divided by the degrees of freedom (with values up to 2 or possibly 3 indicating a good fit), the root mean square error of approximation (RMSEA, values from 0 to .5 or even .8 indicating good fit), the normed fit index (NFI, values in excess of .9 indicating good fit), the Tucker-Lewis index (TLI, values of .9 or higher indicating good fit), and the Aikaike information criterion (AIC, a measure of fit used to compare models, with lower values indicating a better fit than higher values). The results presented in Table 2 provide evidence that model 1.2 is associated with the most impressive goodness-of-fit estimates, although all three models have similar estimates.

Table 3 contains the parameters for each model. As has been observed in several studies, the relationship between math and verbal self-concept scores appears to be positive and small. In contrast to previous research, however, the correlation between math and verbal achievement is also very small (i.e., not statistically different from 0). Additional descriptive analyses (i.e., investigation of histograms and descriptive statistics) were conducted to determine whether the correlation was attenuated due to low reliability, suffering from range restriction, or due to a lack of normality in each score's distribution. All three possible statistical explanations for the lack of correlation were examined and found to be without merit.

The other relevant parameters in model 1.2 were similar to those predicted by the I/E model. The math achievement–math self-concept and verbal achievement–verbal self-concept parameters were positive, moderate in magnitude, and statistically significant, while math achievement–verbal self-concept and verbal achievement–math self-concept parameters were negative, statistically significant, and smaller than the math–math and verbal–verbal estimates.

Multigroup Comparisons

In order to test the hypothesis that the model was similar for students with varying areas of strength, the same model (i.e., Model 1.2) was tested with all three groups at the same time. This base level information (Table 4) was then compared to subsequent models in which the parameters of interest were fixed across all three groups. For example, to test whether the relationship (i.e., path coefficient) between math achievement and math self-concept was invariant among the three different groups of students–students with math strengths, with verbal strengths, and with strengths in both areas–the math achievement–math self-concept path coefficient was fixed to be identical in all three groups. The results of the all-free-parameters model ($\chi^2[145] = 186.34$) were subtracted from the results of the fixed variable model ($\chi[148] = 194.11$) to arrive at $\chi^2(3) = 7.77$, which was not statistically significant at an alpha level of .01 (i.e., we should not reject the hypothesis that the

TABLE 1
Descriptive Statistics and Reliability Estimates for SDQII Scale Scores

	Descriptive Statistics					Reliability Estimates	
Scale	*Mean*	*SD*	*Kurt*[a]	*Skew*[a]	*Mean from Plucker et al.*	*Alpha*[b]	*SEM*[b]
Math	5.06	.71	2.23	-1.41	4.64	.89	.24
Verbal	5.03	.82	.41	-.96	4.86	.89	.27

Note: Mean from Plucker et al. (1997) is provided for comparison purposes.
[a] Kurt = kurtosis (standard error = .42); Skew = skewness (standard error = .21). [b] Alpha = Cronbach's alpha; SEM = standard error of measurement.

TABLE 2
Goodness-of-Fit Estimates for Tested Models

	Goodness-of-Fit Indices[a]							
Model	χ^2	df	*p*	χ^2/df	*NFI*	*TLI*	*RMSEA*	*AIC*
Null	979.40	66	.00	14.84	—	—	.33(.31-.35)	1003.40
1.0: basic model	105.82	51	.00	2.08	.892	.922	.09(.06-.12)	159.82
1.1: basic model with self-concept uniquenesses correlated	101.63	50	.00	2.03	.896	.925	.09(.06-.11)	157.63
1.2: model 1.1 with additional correlated uniqueness	68.92	48	.03	1.44	.930	.969	.06(.02-.09)	128.92

Note: Model 1.0 has no correlated uniqueness and is the basic model represented in Figure 1. Model 1.1 points a correlation between the uniqueness of the self-concept latent variables (i.e., the measurement error for math and verbal self-concepts is related), and Model 1.2 includes both the self-concept latent variable uniqueness correlation and correlations between the uniquenesses of the math 2–math 3 and math 2—verbal 1 variable points (i.e., these variables share common sources of measurement area).
[a]NFI = normed fit index (Bentler-Bonett Index); TLI = Tucker-Lewis Index; RMSEA = root mean square root of approximation (parenthetical values represent 90% confidence interval); AIC = Akaike Information Criteria.

parameter is the same across the three groups of students). Based on these analyses, we are not prepared to state that the relationship between achievement and self-concept for the three groups differed.

This process was repeated for each of the major coefficients of interest, specifically those between the major latent variables in the I/E model. In addition, we examined the invariance of all of the major parameters collectively (the All Parameters Fixed model in Table 4). For all but one of these models, results did not suggest that the hypothesis of invariance could be rejected. The only exception was the correlation between math and verbal achievement, which was expected due to the fact that this correlation was the basis for our distinction between the

TABLE 3
Relevant Parameter Estimates for Tested Models

Model	Relevant Parameters[a]					
	MACH VACH	*MACH MSC*	*VACH VSC*	*VACH VSC*	*VACH MSC*	*MSC VSC*
Null	—	—	—	—	—	—
1.0 basic model	-.032	.494	.429	-.367	-.247	—
1.1: basic model with self-concept uniqueness correlated	-.032	.497	.431	-.371	-.251	.209
1.2: model 1.1 with additional correlated uniquenesses	-.032	.500	.428	-.366	-.237	.151

Note: MACH-VACH is a correlation between the unobserved math and verbal achievement variables, and MSC-VSC is a correlation between the self-concept score uniquenesses; all other parameter estimates represent path loadings in the basic model.
[a]MACH = math achievement (SAT math); VACH = verbal achievement (SAT verbal); MSC = math self-concept; VSC = verbal self-concept.

three groups of students (i.e., we used this difference to classify the students' data into the three groups). The multigroup invariance testing provided considerable evidence that the internal/external frame of reference model explained the development of gifted adolescents' self-concept in similar ways for students with both specific and general academic strengths.

DISCUSSION

These results confirm that the internal/external frame of reference model may be an appropriate framework with which to view the development of self-concept for adolescents who are gifted identified under standardized conditions (i.e., as opposed to the more ambiguous identification criteria used by Williams and Montgomery [1995]). The major implication of the model is that educators should not expect children who are gifted to have high subject-specific self-concepts in all subjects in which they excel. To the contrary, mathematics achievement was negatively related to verbal self-concept, as was verbal achievement and math self-concept to a lesser extent. Educators need to keep in mind that internal comparison processes are at work within students who are gifted, and that high achievement does not necessitate correspondingly high self-concept. For example, a student with high mathematics achievement will probably have a high math self-concept, but her verbal self-concept may be depressed as a result-*regardless of her verbal achievement.*

The data also suggest that the model was as effective in explaining the self-concept development of students with particular strengths in mathematical or verbal domains as it was for explaining the self-concept development of students talented in several content areas. This finding is important, since it contradicts Skaalvik and Rankin's (1992) hypothesis that the I/E model is not applicable to children with domain-similar competency perceptions, such as those indicated by many students who are gifted. In other words, the same internal comparison processes appear to exist within students with specific content expertise *and* students with a broader range of exceptional achievement.

The major discrepancy between the results of the present study and previous research with general ability populations is the very small cor-

TABLE 4

Statistical Tests for Structural Differences Among Students with High Math, High Verbal, and Both High Math and High Verbal SAT Scores

Model	df	χ^2	Δdf	$\Delta\chi^2$	*p*	*Decision*
All parameters free	145	186.34				
All parameters fixed	155	201.82	10	15.48	>.10	Fail to reject
Math achievement—Math self-concept parameter fixed	148	194.11	3	7.77	>.05	Fail to reject
Verbal achievement—Verbal self-concept parameter fixed	150	194.73	5	8.39	>.10	Fail to reject
Math achievement—Verbal self-concept parameter fixed	146	187.68	1	1.34	>.20	Fail to reject
Verbal achievement—Math self-concept parameter fixed	146	186.35	1	.01	>.90	Fail to reject
Math achievement—Verbal achievement correlation fixed	148	197.28	3	10.94	<.02	Reject

relation between math and verbal achievement. With respect to sampling issues, we suspect that the lack of substantive correlation is sample-specific and may not be replicable with gifted students identified using other means besides out-of-level testing with the SAT. Regarding methodological issues, the possibility exists that previous research investigating the I/E model has not utilized achievement measures with sufficiently high ceilings for use with academically talented students. Given the reported SAT score distributions of similar samples of talented students identified using the Talent Search model (e.g., Ablard & Lipschultz, 1998), we suspect that the absence of a ceiling effect may be the cause of the anomaly. Students tested well out of level are not subject to a ceiling effect, and their scores appear to be normally distributed-again, both in this sample and in other samples identified using Talent Search techniques.

Educators need to keep in mind that nternal comparison processes are at work within students who are gifted, and that high achievement does not necessitate correspondingly high self-con-

THE ROLE OF MULTIPLE INSTRUCTIONAL CONTEXTS

A third area of interest was whether the I/E model could adequately describe the development of math and verbal self-concepts for gifted students participating in challenging, extracurricular academic programs. Although this study addressed this issue only indirectly (i.e., only self-concept was measured during the program, not achievement), we found evidence that the I/E model was effective for explaining the self-concept development of this select group of students.

This last result leads us to a discussion of the importance of instructional contexts on gifted students' self-concepts. Students who are gifted spend their academic lives in a variety of instructional (i.e., external) contexts (see Stocking, 1998). In additional to the regular classroom, they attend after school, weekend, and summer programs, all which allow the talented adolescent to interact with a different peer group than is found in regular classroom settings. An interesting extension of the I/E model would be to cover multiple assessments of self-concept and achievement over multiple contexts, such as the regular classroom and an intensive summer program. Comparing the same model to students of average ability would also be of interest. As Marsh et al. (1995) note, the impact of a particular instructional context on gifted adolescents' academic self-concepts may be influenced by the method for selecting participants for a program, the ability of the teacher to work with academically talented students, and the level of competition, type of curriculum, and assessment strategies the students encounter within the program.

Marsh et al. (1995) discussed these variables in terms of preadolescents' participation within one instructional context, which reflects the usual practice of researchers in gifted education to focus solely on one context (e.g., the current study; Brounstein, Holahan, & Dreyden, 1991; Dauber & Benbow, 1990; Hansen & Hall, 1985; Olszewski, Kulieke, & Willis, 1987; Plucker et al., 1997). Several researchers have also investigated the role of concurrent contexts, comparing the self-concepts of students in classes for the gifted and mixed ability classes (e.g., Chan, 1988; Kulik & Kulik, 1992; Schneider, Clegg, Byrne, Ledingham, & Crombie, 1989; Zeidner & Schleyer, 1999). However, talented adolescents may participate in many such contexts over the course of the calendar year. Since these programs may vary considerably with respect to the variables suggested by Marsh et al. (1995), and given the support for the importance of context in the literature (i.e., the studies cited previously all suggest that "context matters"), the case for investigating the role of multiple instructional contexts during the development of gifted adolescents' math and verbal self-concepts is strengthened. Of course, this research will not be without problems, since much of the learning that occurs in many special programs may not be readily measured by achievement tests, and current self-concept measures may not be as sensitive to change as required for this type of research.

External Comparisons

The presence of external processes is often implied in examinations of the I/E model (e.g., the present study; Skaalvik & Rankin, 1992, 1995). However, given the potential importance of instructional context on gifted students' affective development, the formal inclusion of external variables (i.e., perceptions of peer math and verbal competence) may be helpful. While collecting this data poses certain logistical problems, they are not insurmountable. A possible model for extending this research appears in Figure 2. Although this model appears to be complex, we believe it is a more informative model for understanding academically talented adolescents' academic self-concept development than the basic I/E model. In fact, considering that many adolescents who are gifted participate in special programs *during* the school year, the perceived competencies of students' peers in those programs could be added to the model.

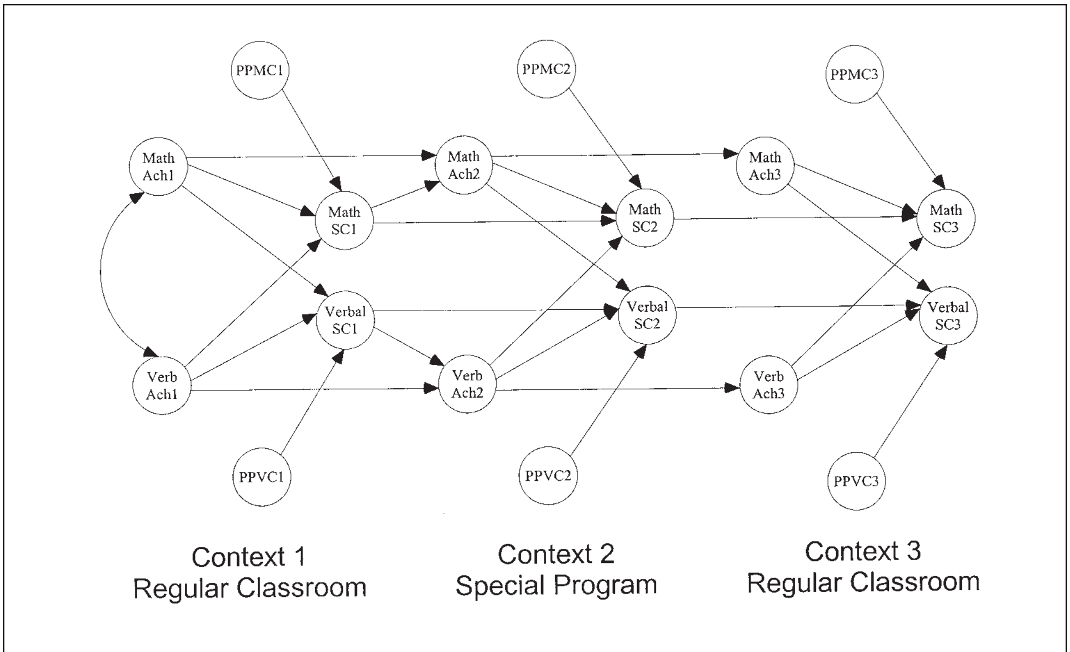
Additional Future Directions

In this article, we addressed one specific model of self-concept development, the internal/external frame of reference model, and used one achievement and one self-concept measure to do so. Other potentially relevant models and instruments exist, and these should also be examined. For example, Pyryt and Mendaglio (1994) have proposed a multidimensional model of self-concept that differs from that used in this study and may provide different avenues for explaining gifted adolescent's self-concept development.

Of course, the study of gifted adolescents' self-concept development should not focus solely

FIGURE 2

Extended I/E Model for Examining Effects of Multiple Instructional Contexts in Gifted Adolescents' Self-concept Development



Note: Math Ach = Mathematics Achievement; Verbal Ach = Verbal Achievement; Math SC = Math Self-concept; Verbal SC = Verbal Self-concept; PPMC = Perceived Peer Math Competency; PPVC = Perceived Peer Verbal Competency. Contexts 1 and 3 represent subsequent academic years, while Context 2 represents an intervening summer program.

on academic self-concept. Future work should extend this model to address the influence of academic self-concept on the development of nonacademic dimensions, such as self-concept in peer relations, physical attractiveness, and inter- and intrapersonal relations. For example, studies of peer processes (Cooley et al., 1991; Cornell et al., 1990) suggest that positive self-concept may be important for positive peer status within a program for the gifted, which may be especially salient for talented adolescents experiencing loneliness or rejection-providing an affective justification for examination of external comparison processes across instructional contexts. Other affective variables, such as intrinsic motivation, may also provide additional insight into talented students' development. These variables should be incorporated into developmental models (e.g., see Skaalvik & Rankin, 1995) to provide a fuller understanding of the unique developmental experiences of being intellectually talented.

IMPLICATIONS FOR PRACTICE

The internal/external frame of reference model proposed by Marsh for general ability samples of students appears to be appropriate for use with students who are gifted. Interestingly, the model worked well for explaining the self-concept development of the three groups of students in this study (i.e., those strong in mathematical but not verbal areas, those strong in verbal but not mathematical areas, and those strong in both areas), with no relevant structural differences in the model among the three groups.

Educators and parents should be aware that, regardless of variations in academic achievement profiles, gifted adolescents' academic self-concepts result from internal processes (i.e., comparing one's achievement in one area to achievement in other areas) *and* external processes (i.e., comparing one's academic performance to that of peers). High achievement in one area may positively influence self-concept in that same area, but it will probably have a nega-

The results of this study suggest that the conventional wisdom of academically talented students seeing themselves in a uniformly positive light is misguided.

tive influence on self-concept in other areas. The results of this study suggest that the conventional wisdom of academically talented students seeing themselves in a uniformly positive light is misguided: Students who are gifted apparently see themselves as complex, multifaceted people, even within the area of academic performance, and educators and parents should try to see them in the same light. In other words, adolescents who excel at similar levels in different academic domains, such as math and English, may not see themselves as being equally successful and talented in both areas. Both internal factors, such as personal achievement in other content areas, and external factors, such as the attitude of teachers and parents and the achievement of peers, influence the way that students interpret their abilities.

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