CHAPTER SIX

The Relationship Between Talent, Flow and Achievement

Since flow and talent in math were found to be related in Study I, the question becomes, "to what extent does achievement depend on these factors?" To test whether motivation and aptitude predict course achievement independently, a series of regression analyses were conducted as part of Study II using data from the four 30-week math program groups. The research and findings described in this chapter treat achievement in fast-paced math courses as the dependent factor in terms of math ability and flow, extrinsic motivation, task enjoyment and cognitive ease.

Mathematical Achievement

Grade point averages (GPA) were used to benchmark achievement (Table 6.1). For students who reported earning A's in math without much effort before entering this program, these grades and their averages represent a fairly radical change. As may be expected of gifted students, there were few failing grades and a predominance of higher ones. Even so, consistently fewer than half of the students received A's. Fifty-five percent earned B's or below, uniform across the four years of study. An examination of quarterly grades revealed one gender difference. Girls earned higher final grades than boys during the 1994-95 school year ($F = 3.99$, $p < .05$). Otherwise, there were no gender

differences to speak of in terms of achievement within the program. Grades were given according to points earned on exams, homework and projects. Students received grades four times per year; the average of which constitutes the grade point average (see Table 6.1 note b for letter grade equivalents).

Table 6.1 Means, Deviations, and Ranges for Talent Search Grade Point Averages (GPA)

Term	N[a]	Mean[b]	s.d.	Minimum	Maximum
GPA 92-93	50	2.71	.76	0.58	4.00
GPA 93-94	70	2.91	.68	0.25	4.00
GPA 94-95	66	2.92	.80	0.17	3.92
GPA 95-96	67	3.05	.70	1.42	4.00

[a] N's vary due to students who were added, dropped or received incompletes.

[b] Letter grades correspond to the following numerical scale:

A = 3.34 to 4.00 C = 1.34 to 2.33 F = 0.00 to 0.33
B = 2.34 to 3.33 D = 0.34 to 1.33

Ability, Flow and Achievement

On the basis of previous research, it was hypothesized that ability and intrinsic motivation, operationalized as the experience of flow, would independently predict achievement in talent search math courses. To test this claim, measures of association were calculated between the three sets of variables.[1] Because SAT-M and flow were

1. Descriptive data for ability and flow may be found in Chapter 5, Tables 5.1 and 5.2.

found to be correlated, and given the attenuation on SAT-M due to talent selection, correlations were adjusted using procedures found in Lord & Novick (1968) to yield a better estimate of the relationships that exist in a normal population (these adjusted *r*'s and their probabilities are included in Table 6.2). This was done in order to lessen the chances of rejecting an actual relationship between ability and achievement, a Type I

Table 6.2 Results of Regressions of GPA on Ability and Flow

			Ability			Flow A		
GPA Year	n	R^2	*r*	final β	*t*	*r*	final β	*t*
1992	47	.295	.435**	.152	0.907	.531***	.431	2.571*
1993	69	.176	.222	.118	1.012	.404***	.371	3.186**
1994	57	.280	.500***	.462	4.049***	.292*	.177	1.548
1995	65	.268	.443**	.433	3.921***	.284*	.268	2.429*

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

error. In three out of the four years, ability was significantly correlated with performance. Only during 1993 was an association between SAT-M and GPA not found. By comparison, during all four years flow and GPA were significantly correlated. The same pattern of strong relationships was also found when flow was sampled at the mid- and end-points of the four years.[2]

Then, to test the relationship between ability and motivation in terms of performance, regressions were computed using the adjusted correlation matrices. Composite flow

2. The mean correlation between flow and GPA at week 1 was .378, at week 15 it was .376; at week 30 the mean was .431.

scores prior to the start of the program (Flow A) were used as the measures of intrinsic motivation (Table 6.2). Flow from weeks 15 and 30 were not included to minimize the possibility that flow is dependent on GPA rather than the other way around., which, as footnote 2 suggests, is a possibility.

Exploratory analyses indicated no interactions between the independent variables. Furthermore, no gender differences were found. However, there is a chance that by assigning students to class groups based on their abilities (i.e., Math A and Math B) a secondary implicit selection effect was introduced. Analyses of the relationships between ability, flow and achievement by class types do not indicate this to be a serious problem. For example, during 1993 no correlation between SAT and achievement could be found by analyzing the seven classes separately or by analyzing Math A, Math B and geometry groups one at a time. The lack of association cannot be attributed to ability grouping, rather some random effect involving subjects who elected to enroll that particular year. It was decided not to study classes or types of classes separately as this would have resulted in small sample sizes and correspondingly low power.

When controlling for flow, ability accounted for significant variance in achievement during the last two years only. The hypothesis that ability is the better predictor was thus only partially supported by these multiple regression analyses. On the other hand, flow was found to predict GPA three out of four years, with the exception of 1994. While it may be reasoned that flow is a more dependable predictor of performance, ability accounted for more of the variance in performance *when it happens to predict it,* which was half the time. Both are qualified claims and it is not immediately clear which of the

two may be more defensible. Nonetheless, these data do substantiate the assertion that ability and motivation independently predict achievement.

Over the four regression models, flow and ability *each* explained 11% of the variance in grades. On the average, a larger percentage of the variance in grades was explained by ability alone. However, when flow was added to the equation, the variance explained by ability was reduced by an average of 29%. Controlling for ability, the corresponding variance explained by flow was reduced by 19%. While performance surely depends on other factors than these, both are significant in their effects.[3]

Achievement, Ability, Flow and Extrinsic Motivation

In the context of demonstrated ability, it was also hypothesized that flow would predict achievement better than extrinsic motivation. To test this, data from the 1995 cohort on motivational orientation was utilized.[4] An index score was created to measure the relative strength of students' reasons for being interested in math. As described in Chapter 5, extrinsically motivated individuals tended to emphasize the importance of earning good grades, competing with other students and preparing for a career. They also reported less flow and demonstrated less talent in math than their intrinsically motivated peers.

3. This average reduction in variance explained by ability does not compare to the 50% figures reported by Schneider & Bös (1985), although during the first two years of the study this was definitely the case (cf. Table 6.2).

4. Comparable data was not available for the three previous years.

Regression results for a model incorporating SAT-M ability, initial flow and extrinsic motivation are given in Table 6.3. Ability was the best predictor of achievement, followed by flow. As found before (i.e., Table 6.2), both factors were independent in their effects. Extrinsic motivation, on the other hand was negatively associated with GPA, though not to a significant extent. This finding supports the hypothesis that flow (as a measure of intrinsic motivation) is better than extrinsic motivation in anticipating future achievement.

Concerning the more traditional comparison between intrinsic and extrinsic motivation, it was reported in the last chapter (Table 5.8) that students in 1995 earned higher GPA's if they were intrinsically motivated: 3.27 (high B+) compared to 2.85 (B),

Table 6.3 Results of Regressions of GPA on Ability, Flow, and Extrinsic Motivation (Data Source: 1995 Talent Search Math Program, n = 61)

Effect	*r*	final β	*t*
SAT-M	0.458	0.438	3.780***
Flow A	0.324	0.293	2.339*
Extrinsic Motivation	-0.272	-0.017	-0.128

* $p < .05$ *** $p < .001$ $R^2 = 0.300$

$F = 5.539$, $p < .025$. In case placement into classes introduced a further selection effect on ability, this data was examined controlling for type of class (Math A, Math B,

Geometry).[5] The results indicate that GPA still differed significantly depending on intrinsic or extrinsic motivational orientation ($F = 4.626$, $p < .05$).

Students whose initial interest in math was intrinsic earned grades that were significantly highly than students who were oriented toward earning good grades, competition or career preparation (see Table 6.4). And while those with above average levels of talent (i.e., SAT-M > 500) tended to earn higher grades, the effect for ability was not significant. No interaction was found between orientation and ability.

The effect of intrinsic motivation on achievement was particularly apparent among the more highly gifted students. On the average, students with an intrinsic focus earned grades half a grade point higher than those with an extrinsic orientation--the difference between an A and a B ($F = 7.857$, $p < .01$; post hoc protected comparison). Controlling for ability, this typifies the pernicious effect of extrinsic motivation on performance acknowledged ever since Deci (1971, 1972). By contrast, students with significantly less ability but an intrinsic orientation earned slightly higher grades. What they may have lacked in terms of ability was compensated by their interest in math.[6] Nonetheless, their GPAs were still significantly lower than higher ability students who shared the perception that math was interesting in itself ($F = 5.019$, $p < .05$).

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5. It may be recalled that placement into Math A required an SAT-M score of 470 or higher, Math B required a score of 420 or higher. Geometry required completion of Math A or B.

6. This is reminiscent of Krutetskii's claim that "a person who has abilities but no interest in an activity will produce less than one with a keen interest in the activity but no striking abilities in it" (1976, page 346).

Table 6.4 Results of Two-way ANOVA: GPA Achievement Means for Ability by Motivation[a]

Motivational Orientation	Ability: SAT-M < 500	Ability: SAT-M > 500	Average
Intrinsic	**2.94** n = 12 (s.d. =.21)	**3.39** n = 16 (s.d. =.19)	3.16
Extrinsic	**2.70** n = 19 (s.d. =.17)	**2.79** n = 12 (s.d. =.22)	2.75
Average	2.82	3.09	2.96

[a]Source: 1995-96 cohort

Consequently, talent cannot be discounted as a factor in achievement even among students in the upper reaches of math ability for their age. As these findings suggest, talent performs less effectively in the context of extrinsic motivation: students with an intrinsic focus do work that earns them considerably better grades and less capable students earn grades that are comparable. But by itself intrinsic motivation is not enough to compensate for a lack of ability: students with more ability and an intrinsic motivation achieved more than less talented, intrinsically motivated students.

Achievement, cognitive ease and task enjoyment

Several studies reviewed in chapter 1 determined that perceptions of competence rather than intrinsic task motivation directly affected performance outcomes (e.g., Seegers and Boekaerts, 1993; Valås and Søvik, 1993). Studies of flow propose a different effect,

that *task enjoyment* may be a better predictor of performance than perceived competence (*cognitive ease* in the present study), because task enjoyment is not highly dependent on ability (e.g., Schiefele and Csikszentmihalyi, 1995).

Contrary to expectation, it was found in the previous chapter that task enjoyment and ability were significantly related in a population less restricted on ability. Unfortunately, no post-SAT achievement data was available for the students who provided that data (from the county-wide talent search) in order to investigate the relationship. Instead, data on achievement came from students who enrolled in the 1995 talent search math classes, in which ability and task enjoyment were not significantly related ($r = 0.053$, *n.s.*); neither were ease and ability related for that matter ($r = 0.079$, *n.s.*). Therefore, the findings could turn out to be different in a group in which flow and ability are related.

Given this caveat, to determine whether task enjoyment and cognitive ease are equal in their effects, both factors along with ability were entered simultaneously into a regression equation on GPA. The results attest that when motivational factors do not covary with talent, talent is the best predictor of achievement, followed by task enjoyment (Table 6.5). Although positive, cognitive ease contributed little effect. In this case, the hypothesis that achievement depends more on task enjoyment than cognitive ease was supported, but not for the theoretical reasons given. It was thought that cognitive ease, because of its relation to talent, would not predict achievement independently. Removing ability from the equation, task enjoyment was the only significant effect ($\beta = .274$, $p < .05$; the beta coefficient for cognitive ease was 0.089, *n.s.*).

Table 6.5 Results of Regressions of GPA on Ability, Task Enjoyment and Cognitive Ease (Data Source: 1995 Talent Search Math Program, n = 62)

Effect	*r*	final β	*t*
SAT-M	0.465	0.451	4.072***
Task Enjoyment	0.296	0.293	2.251*
Cognitive Ease	0.182	0.051	0.435

* $p < .05$ *** $p < .001$ $R^2 = 0.297$

To test whether the regression would be appreciably different when the data matched the theoretical assumptions, the same procedures were used to analyze data from the 1993 program. Here task enjoyment and talent were not correlated ($r = 0.021$, *n.s.*), but cognitive ease and talent were ($r = 0.268$, $p < .05$). The main concern in employing this data was that in 1993 fewer variables pertaining to cognitive ease were incorporated in the flow questionnaire; nonetheless, the ones that were used loaded on the same factors and in a similar fashion as in 1995 when more items were factor analyzed.[7]

As shown in Table 6.6, only task enjoyment was significant in its effects. Controlling for talent and enjoyment, the relationship between cognitive ease and achievement was not significant. The same result for talent was found as in Table 6.2. Both sets of findings suggest that task enjoyment and cognitive ease are not equal in their effects.

7. 1995 was the only year during which perceptions of competence were explicitly measured. With ample opportunity for replication, questionnaires were administered a total of 12 times during the four year period. In this respect, the 1992, 1993 and 1994 analyses were very much alike 1995 in their factor loadings. Only two items were not consistent in their placement, one measuring students' willingness to work hard despite challenges and the other depth of concentration. For the purpose of testing differences between cognitive ease (perceived competence) and task enjoyment, these were omitted from further consideration.

Table 6.6 Results of Regressions of GPA on Ability, Task Enjoyment and Cognitive Ease (Data Source: 1993 Talent Search Math Program, n = 58)

Effect	*r*	final β	*t*
SAT-M	0.187	0.121	0.993
Task Enjoyment	0.455	0.350	2.539*
Cognitive Ease	0.407	0.194	1.355

* $p < .05$ $R^2 = 0.260$

Task enjoyment was the better and only significant motivational predictor of performance both when cognitive ease and talent were related and when they were not.

The Effects of Achievement on Motivation

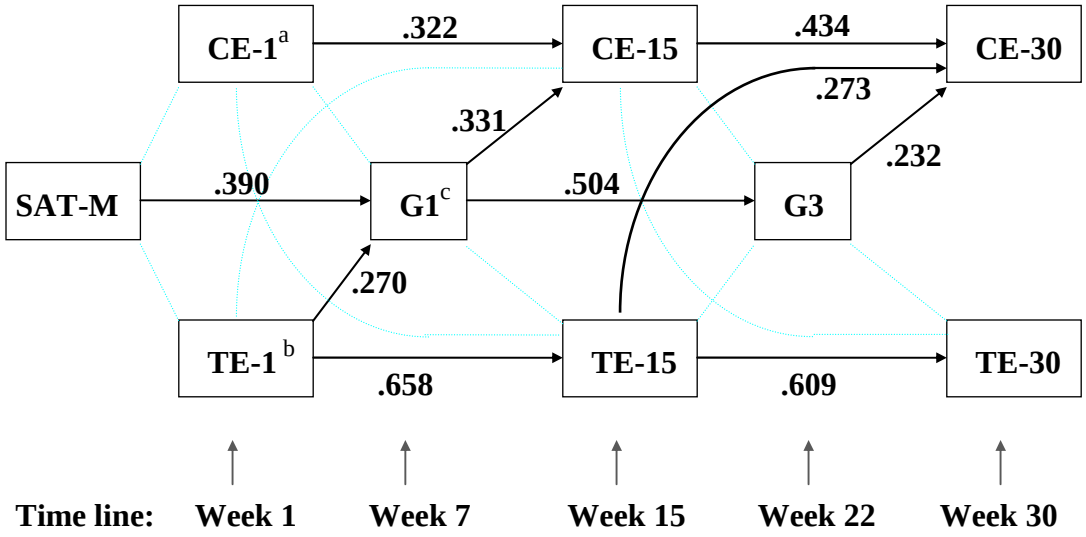
Finally, the relationships between ability, achievement, task enjoyment and cognitive ease were examined utilizing a path analytic approach and longitudinal data from the 1995 group. Here the purpose was to examine questions that arose in the course of the investigation: 1) does achievement affect motivation more than the other way around, and 2) does task enjoyment affect cognitive ease more than the other way around?

The relationships between cognitive efficiency, task enjoyment, ability and performance were modeled using RAMONA (Reticular Action Model, McArdle & McDonald, 1984). This package in SYSTAT allows path models to be fit to correlation matrices, thus permitting the relationships to be adjusted for SAT-M attenuation. Quarterly grades were used in lieu of GPAs in order that events could be modeled in the order they occurred during the year. Figure 6.1 shows the results of the path analysis for

cognitive ease at weeks 1, 15 and 30 (CE-1, CE-15, etc.), task enjoyment (TE) ability (SAT-M) and grades from the first and third quarters (G1 and G3). Second and fourth quarter grades (weeks 15 and 30) were not utilized to avoid confusion in determining whether achievement or motivation should be regarded as dependent. Significant path coefficients ($t > 2$, $p < .05$) are indicated by a solid line, stippled lines mark hypothesized but non-significant paths. A chi-square test statistic of 30.507 with 16 degrees of freedom, $p = .016$, was obtained for the model.

Just as Flow A and ability were uncorrelated in 1995 (cf. Table 5.4), it may be observed that ability, measured about sixth months before the start of the program,

Figure 6.1 Results of Longitudinal Path Analysis on Achievement, Ability, Cognitive Ease and Task Enjoyment (Data Source: 1995 Talent Search Classes, n = 62)



[a] cognitive ease at week 1 [b] task enjoyment at week 1 [c] grades for the first quarter

predicted neither the ease of doing the work nor its enjoyment. (Their lack of association was also noted in the preceding section.) One might think that a strong performance on the SAT would influence one's estimate of math ability, but this was not the case among these students. The SAT may have been too isolated or distant an event to have had a lasting impact. Or perhaps what mattered most to these adolescents was the fact that they qualified, not by how little or how much.

By comparison, performances within the program were found to have an affect on perceptions of task ease and efficiency. Grades directly and significantly affected students' subjective competence after both grading periods in the model. Thus it seems these perceptions are more susceptible to variations in performance than the other way around. A similar pattern between grades and composite flow was found in the other three annual regressions on GPA using SAT-M, Flow B and Flow C. The relationship between flow and GPA became successively more pronounced later in the year, an indication that grades could well be considered the predictor variable after the onset of instruction.[8] Before concluding that grades always affect students' subjective views this way, it should be noted that in path models using comparable data from other years, quarterly grades produced this effect about half the time.

To an extent, these results suggest nothing new. Attribution theories have made similar assertions for decades: that the quality of one's performance affects estimates of self competence (e.g., Atkinson, 1957; Wegner & Vallacher, 1977; Weiner, 1986). There

8. Compared to Flow A, the beta values for Flow B and Flow C on GPA kept increasing. For example, 1994: Flow A = .177, Flow B = .241, Flow C = .344. What was a non-significant relationship with grades at the start of the year was significant below the .01 level by the end.

is no reason to think that math or giftedness are unique in this regard. Competence attributions dropped significantly once course work began. From week 1 to week 15, competence declined from .740 to .618 on a scale from 0 to 1, a difference with a *t* value of 3.932, $p < .001$. In the path model, this loss appears to be directly influenced by performance during the first half of the year (point estimate = .331, $t = 2.68$, $p < .01$). Perhaps frustration would be the appropriate word to describe the experience.

Surprisingly, frustration had minimal impact on task enjoyment. In this case, grades earned did not affect the intrinsic rewards of doing math much at all. There was also a drop in scaled task enjoyment between weeks 1 and 15 from .705 to .641 ($t = 2.385$, $p < .025$), but it was not at all related to how well or poorly students performed (point estimate = .02, $t = 0.19$). Comparing this data to the previous three years, an effect on enjoyment attributable to grades was the exception rather than the rule. Only in the first half of 1992 and the last half of 1993 was this effect found, two of the eight times the relationship was monitored. While it cannot be ruled out that enjoyment may be influenced by grades, cognitive ease was affected twice as often, always after the first grading period.

As for the effect of exogenous variables on grades, SAT-M exerted the greatest influence. Regression results for 1995 reveal a result seen before (cf. Table 6.2): SAT-M accounted for the most variance in GPA, followed by flow. The effect reappears in the path diagram with the added revelation that performance was affected by initial task enjoyment and not cognitive ease. Controlling for ability, task enjoyment independently

predicted first quarter grades during 1995, subjective ease did not.[9] This information suggests that, of the two factors in the flow construct, intrinsic task rewards is the crucial element in terms of achievement. Time after time, what students thought of their abilities or their past performance had little affect on grades.[10] Controlling for prior accomplishments, task enjoyment predicted grades twice as often as perceived ease, a correlate of subjective competence.

The model also shows that the subjective ease and enjoyment students had as they entered the program remained with them throughout the year. Those individuals high in task enjoyment before they started classes were still the highest at the end of the year. Although there was a net loss in enjoyment over the thirty weeks, individuals who experienced the least loss started with the most; those highest in perceived competence to start with were still the highest at the end of the year.

The relationship between task enjoyment and cognitive ease suggests that the latter is driven by enjoyment and not the other way around. Students who found the work to be just right for their abilities did not become happier as a result. But those who found the experience intrinsically rewarding had a noticeable tendency later to assess their abilities in a more positive light. During the first part of 1995 this effect operated indirectly

9. A similar phenomenon may be noted in Wong and Csikszentmihalyi (1991). Ability best predicted the GPAs of talented high school students. For both males and females, satisfaction with performance while studying had no effect on GPAs while unselfconsciousness did. Conceptually, loss of self-consciousness contributes to negentropy, hence task enjoyment. Satisfaction with performance is allied with subjective competence.

10. Only once did perceived competence predict performance, prior to the third quarter of 1994.

through performance; during the latter half of the year it directly affected those perceptions independent of achievement.

On the basis of these findings, the hypothesis that perceptions of ease would predict math performance better than intrinsic task enjoyment was not supported. Instead, task enjoyment was found to be the better predictor. Not surprisingly, previous grades were the best.

There is some evidence to suggest that a different relationship between cognitive ease and grades may exist for boys and girls. Selecting for gender, path analyses based on the relationships in Figure 6.1 revealed that male students who perceived that the work came easily also earned higher grades. Female students, on the other hand, who perceived the work to be hard earned higher grades. Males and females alike who earned higher grades also developed stronger perceptions of ease. Unlike males, females' perceptions of ease and related competence were found to depend significantly on their positive experiences of enjoyment.

These opposite findings seem to fall in line with gender attitude differences known to exist (Ekstrom, 1994). One possible explanation for the difference is that in assigning grades, teachers may have been influenced to give higher grades to boys who appeared to have an easy time of it, and higher grades to girls who appeared to lack confidence or struggle, perhaps as an encouragement or a compensation for working harder. Given there is no other data from the present study to confirm it, this is a rather speculative claim, and due to the small number of cases in the sample these findings should be taken tentatively.

In the combined model, subjective ease/competence was found to depend more on intrinsic enjoyment than vice versa. As the next chapter will explore, the more that students enjoyed classroom tasks the more likely it was that their subjective competence would increase over the course of the year ($r = 0.286$, $p < .05$). This relationship is even more striking when the order is reversed: the more perceived competence students had at the beginning of the year, the more likely it was that they would experience successively less enjoyment as the year wore on ($r = -0.277$, $p < .05$). Whereas enjoyment facilitated greater feelings of competence and control, feelings of competence and control inhibited the intrinsic pleasure of task involvement. Paradoxical as it seems, an explanation for this relationship already exists in terms of flow, discussed below.

Summary and Discussion: *Predicting Achievement*

As the data has shown, both ability and motivation help to explain why students achieve what they do. Specifically, talented students excel when their motivation is intrinsic to math. All the individuals who were involved had the ability to do well in math. Each was qualified for participation because of a record of outstanding performance. Perhaps because their ability was so much alike, the subsequent effect on achievement was not as strong as expected, possibly a result of restriction in score variance.

Quite uncharacteristic for a measure of ability, SAT-M correlated significantly with achievement in ten out of the sixteen quarters studied (62.5% of the time). The situation was even more acute when math and verbal reasoning scales were combined, in which

case there was a correlation with math performance only 44% of the time. Math reasoning by itself was a better predictor.

Typically, studies have found a stronger correspondence between aptitude and performance than this. In Schiefele and Csikszentmihalyi (1995), the average correlation between PSAT and grades was nearly twice the size of the average coefficient in the present study (0.46 versus 0.27). Although adjustments were made for attenuation it may be assumed that the results would have been even stronger had the study not been limited to students with outstanding ability.

When enjoyment occurred in the context of this ability, better grades resulted. In the majority of cases, above average levels of flow in math preceded earning A's. With below average flow, the most common grade earned was a B, regardless of ability. As hypothesized, intrinsic motivation and ability affected achievement independently. Contrary to expectations, ability did not explain more variance in achievement than flow.

Extrinsic motivation had a marginal but negative effect on performance. It is ironic that students whose interest in math at the beginning of the year was defined by getting good grades earned marks that were, on the average, half a letter grade lower than students who found math rewarding in itself. It is not an irony that is new: the greater an emphasis on extrinsic rewards the lower the grades (e.g., Gottfried and Gottfried, 1991); school achievement is positively related to an intrinsic reward orientation (e.g., Early & Barrett, 1991). The present study provides additional evidence that achievement depends on the kinds of rewards students find compelling.

Numerous studies have found modest correlations between intrinsic motivation and performance, for example: Mitchell (r = .17, 1992), Amabile, et al. (r = .22, 1994), Schiefele and Csikszentmihalyi (r = .31, 1994).[11] Occasionally, grade point average and motivation have been uncorrelated as in Wong and Csikszentmihalyi (r = -.02, 1991). At other times, stronger correlations have been found between math-specific motivation and performance outcomes, notably, Gottfried (r = .32 and .42, 1985). The average correlation between flow and GPA in the present study fell within this range (r = .39).

Thus far, it has been argued that highly talented students tend to achieve more the greater their intrinsic motivation. However, an important aspect of experience has not been examined: the effect of instruction. To make the argument even more compelling, a discussion of treatment effects is warranted. Such a discussion is reserved for the next chapter, in which task structures and instructional procedures are analyzed in light of the present findings.

Cognitive and Affective Factors

In the majority of researches, the relationship between intrinsic motivation and achievement is modeled as an indirect effect. Motivation is shown to affect grades through the mediation of cognitive factors, for example, perceived competence (Valås & Søvik, 1993), self-efficacy (Seegers & Boekaerts, 1993), and self-regulation (Pintrich & DeGroot, 1990). This was not the case in Gottfried (1985), nor was it the case here. Independent of ability and cognitive ease/perceived competence, affective math

enjoyment remained a significant predictor of grades. Regressions of grade point average on ability, initial task enjoyment and perceived competence twice indicated significant effects for initial levels of task enjoyment (1993 and 1995). There was no effect for initial levels of perceived competence.[12]

On the basis of these findings, the most appropriate model for describing the relationship of flow and achievement is that of the direct effect. The combination of cognitive and affective factors in the flow construct predicted achievement apart from ability. When these factors were analyzed separately, cognitive variables such as subjective competence had no mediating effect on the intrinsic rewards that encourage individuals to persist in an activity for its own sake.

Differential Effects of Performance on Cognitive Ease and Task Enjoyment

The preceding discussion is based entirely on measurements of flow taken prior to the start of instruction. Measurements taken during the course of the year found a stronger relationship between grades and flow at the end of the year than at the beginning, implying that flow is sensitive to achievement. Separate path analyses confirmed that grades were better at predicting subsequent flow than initial flow was at predicting grades. The effect of grades specifically on cognitive ease is also articulated in the results of the 1995 path analysis (cf. Figure 6.1). There was a direct effect between the grades

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11. See also Aiken (1976), Steinkamp & Maehr (1983), and Willson (1983).

12. For motivational variables affected by program experience, there was one significant effect for cognitive efficiency: Flow B (1994) predicted third and fourth quarter grades independent of ability and enjoyment.

and feelings of ease in performing difficult tasks but, perhaps except for boys, not the other way around. This was not true in terms of task enjoyment, however. Whether students earned high or low grades had little influence on subsequent feelings of interest, energy for learning and subject matter liking. Feelings of task enjoyment depended only on previous enjoyment.

Csikszentmihalyi, Rathunde and Whalen (1993) noted a similar finding among talented high schoolers: task enjoyment predicted continued involvement in talent activities; subjective competence did not.[13] Students continued to enroll in more challenging courses on the basis of the intrinsic rewards of the activity, not because they felt confident about their abilities to do the work successfully. Normally, one would predict that loss of control, suspicions of incompetence and difficulty in doing work would impact task enjoyment negatively. Even though students may lack a sense of control, the pleasures of task enjoyment--for instance, unself-consciousness, the inability to keep track of time and so on--may produce a strong enough attraction to keep them coming back for more.

On this basis, the generalization is made that task enjoyment may draw students back to an activity with little regard to past performance (e.g., grades earned). Consequently,

13. Three years after the measures of experience were taken, two critical factors related to enjoyment were found to be significantly related ($p < .01$) to the highest talent level students attained: unself-consciousness and the wish to be doing nothing other than the talent activity at the time. Loss of self-consciousness has been described as intrinsically enjoyable (Csikszentmihalyi, 1990); the wish to be doing nothing else has been used as a measure of intrinsic task interest. Two important qualities of experience did not correlate with highest talent level in the same study: perceptions of control and competence (skillfulness), cognates of cognitive ease.

depending on task enjoyment, one would expect to find fairly continuous involvement in self-rewarding activities.

Inasmuch as task enjoyment was found not to be much affected by grades or subjective estimates of ability but resulted in somewhat higher grades and higher levels of perceived competence, at an organismic level it may safeguard against a cataclysmic failure of interest. Despite setbacks to self esteem and competence, activities can retain their attractiveness and development can proceed. Perhaps due to some pleasure-seeking gene, the enjoyment of tasks may remain fairly well insulated from assaults on control and perceived skillfulness, which may explain why individuals often return even after bitter failures to activities which have given them enjoyment in the past. More than anything else, the prospect of rediscovering the enjoyment--despite cognitive constraints--may influence them to try again.

Among students of talent, there exists a special connection between enjoyment and math achievement. Because they enjoy math, more time is spent pursuing challenging learning activities (Nakamura, 1988); more opportunities for developing talent are acted upon (Csikszentmihalyi, Rathunde, Whalen, 1993). To this knowledge may be added the good possibility that the enjoyment comes more from rewards inherent in the activity, not from grades which are extrinsic, nor even from feelings of control or confidence which, of course, to an individual are intrinsic.