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THE NATURE AND DEVELOPMENT OF GIFTEDNESS: A LONGITUDINAL STUDY

Kurt A. Heller¹

Abstract: *Following a short discussion of conceptual and theoretical problems of giftedness, the methodological foundations and selected results of a (presently) four year longitudinal study are presented. This study is based on a multidimensional concept of giftedness: intelligence, creativity, social competence, musical ability, psychomotor ability (or practical intelligence). Both academic achievements and leisure activities, as well as cognitive and motivational personality factors and school and family socialisation conditions relevant to giftedness, were studied. During the second project phase developmental aspects and achievement analyses of gifted and normal students aged 6 to 18 years were the central aspects of the study. Finally, methodological problems in the identification of gifted children and adolescents as well as consequences for the nurturing of giftedness are discussed.*

THE PSYCHOLOGICAL CONCEPT OF GIFTEDNESS

Broadly conceptualized, "giftedness" can be defined as the totality of personal (cognitive, motivational) potential and sociocultural conditions for learning and achieving (Roth, 1968). The development of giftedness is understood as resulting from the interaction of internal (personal) dispositional factors and external socialization factors. The term is used in psychology both to describe (ability concept) and to explain (qualitative category). These two conceptualizations stem from different research paradigms: (a) nomothetically oriented psychometric studies that attempt to measure quantitative inter- and intraindividual differences in ability, (b) idiographically oriented

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information processing approaches in modern research on problem solving that try to determine qualitative (thought) process components. A third conceptualization is of immediate practical importance: (c) "giftedness" in the sense of psychological aptitude or demands. Here giftedness is considered to be a person's disposition or characteristic profile with regard to particular demands for learning or achievement (i.e. school, university or career planning).

Whereas the psychometric conceptualization of giftedness is directed at general or differential abilities (verbal, quantitative, technical-constructive, or musical abilities factors, etc), in the cognitive psychological approach, elementary information processing units are measured as conditional components of gifted activities. Although in more recent research on giftedness cognitive psychological approaches have been favoured over psychometric research approaches, both research paradigms contribute in their specific way to an understanding of giftedness. One cannot easily be substituted for the other. From process-analytical research on giftedness, important information about conditions that nurture or inhibit the development of giftedness is expected. On the other hand, status-diagnostic (psychometric) results are still considered to be the essential basis of all types of prediction about achievement and success. Diagnoses of giftedness thus serve an important function in nurturing personality, for example in individual developmental counseling or intervention (cf. Heller, 1987, 1989). Both conceptual and practical solutions can often be achieved only when psychometric and cognitive psychological information processing or rather experimental thought process and problem solving approaches are combined. In an analogous fashion, the necessity for differential curricula and school environments specific to types of giftedness is emphasized in modern educational psychology (e.g. Feldhusen, 1985; Gallagher, 1985; Tannenbaum, 1983).

Giftedness also belongs to the so-called hypothetical construct concepts (cf. McCorquodale & Meehl, 1948) whose definition depends on the theoretical framework being employed. This also holds true for related concepts such as intelligence or creativity. Construct concepts are popular in psychology; researchers hope for information about particular behavioral expressions of the personality in the sense of causal factors. For example, exceptional achievement in a foreign language or in mathematics may be attributed to corresponding verbal or quantitative abilities. At the same time, motivational and sociocultural causal factors can be more or less involved in the manifestation of achievement. It becomes clear that every concept of giftedness also includes relatively complex behavioral phenomena. In addition, the definition of giftedness is dependent on the intended use, e.g. on the goals and type of support program, on scientific goals etc. (cf. Hany, 1987; Hany & Heller, 1991; Heller, 1989; McLeod & Cropley, 1989; Sternberg, 1990).

Inasmuch as psychologists claim a difference between intelligence and giftedness, the concept of giftedness may be analogous to aptitude, e.g. giftedness in learning to play a musical instrument, facility in learning foreign languages, high achievement in fine arts or in sciences, etc. The assumption is that there are different forms of

giftedness that can be categorized according to specific behavior and achievement areas. As an example we present a model of giftedness (Heller & Hany, 1986, p. 70) in Figure 1; see also Gardner (1983).

Gagné (1985), who also favors a multidimensional model, differentiates between general and specific gifts on the dispositional side and domain specific talent forms on the behavior or achievement side. The assumption of mediating factors (referred to as "catalysts" by Gagné) is also interesting (e.g. personality factors such as motives, interests, and attitudes, and socialization factors such as family and school). Mierke (1963) also referred earlier to aiding and supporting factors of intelligence in his theory of giftedness. Heller, Rosemann and Steffens (1978) introduced so-called "moderators" as mediating variables for the explanation of predictor-criterion relationships in their prognostic study of educational guidance and counseling on the kind of school to attend.

We define "giftedness" as the individual cognitive, motivational, and social possibilities for attaining excellence in one or more areas (cf. Figure 1). Thus, in this study, we used a multidimensional concept of giftedness. The achievement behavior is seen as the product of the predictors giftedness, personality, and environment (cf. Figure 2). The Munich model of giftedness includes five (research) dimensions that can be related to particular achievement areas (Figure 1):

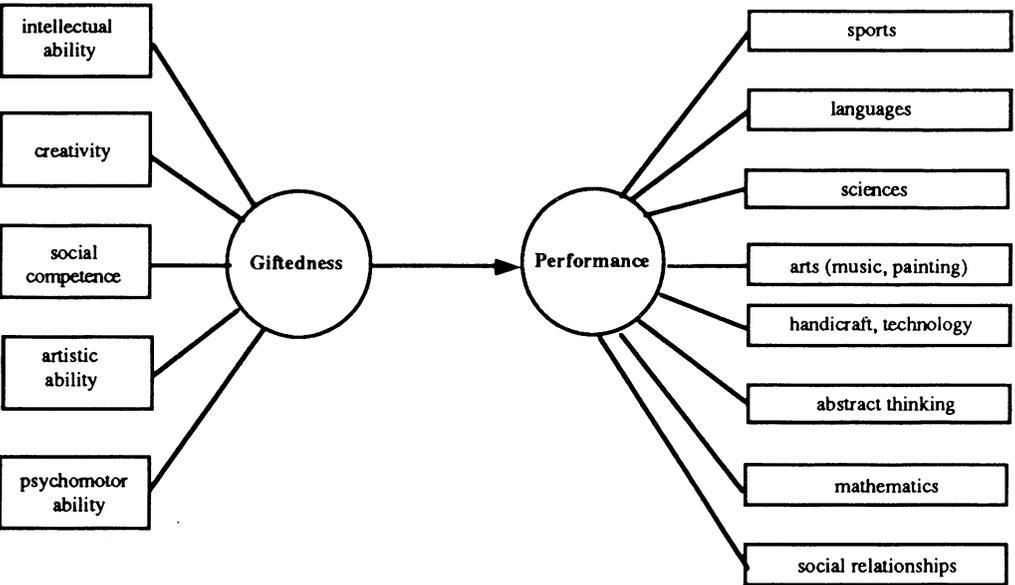


Figure 1. *The division of giftedness and achievement with information about talent factors and performance areas*

— Giftedness arises in the areas of intellect, creativity, social competence, artistic (musical) ability, and/or psychomotor ability.

- The individual dimensions of giftedness correspond to particular academic and non-academic achievements.
- In addition to cognitive abilities, various noncognitive personality characteristics (such as motives, interests, work and learning style) are involved.
- Family and school are the central focus with regard to socialization factors.

PROJECT PHASE ONE

Goals

- (1) The development and evaluation of a differential diagnostic instrument for the identification of highly gifted children and adolescents for various forms of giftedness.
- (2) The observation, description, and analysis of the interrelationship of potential for giftedness and actual performance, in which, along with cognitive and noncognitive personality preconditions, situational or social contextual conditions are also included in the investigation.

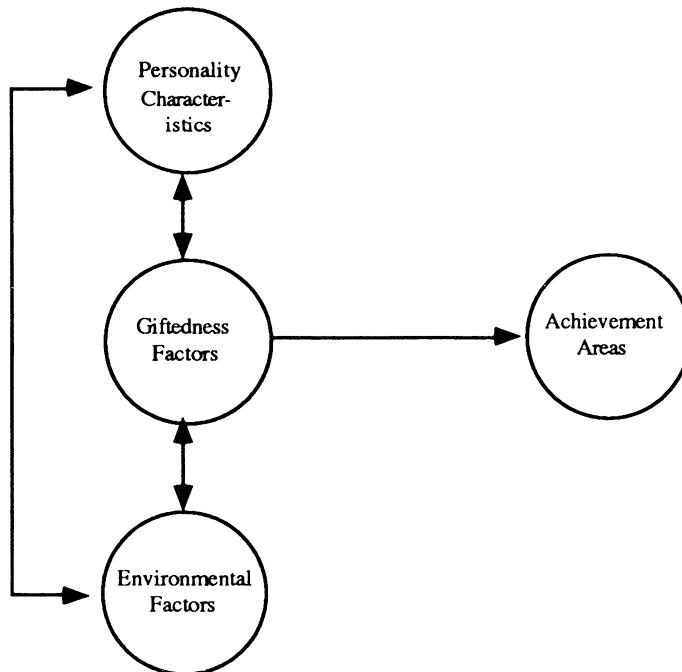


Figure 2. *Multifactorial causal model of giftedness*

Legend: *Personality characteristics:*

- Achievement motivation
 - Hope of success
 - Willingness to exert oneself
- Locus of control
- Quest for knowledge
- Coping skills

Giftedness Factors:

- Intelligence
- Creativity
- Social competence
- Artistic (musical) ability
- Psychomotor ability

Environmental characteristics:

- Stimulation in the home environment
- Parental educational level
- Number of siblings and birth order
- City vs country origin
- School climate
- Critical life events
- Role expectations regarding "Giftedness"
- Performance demands at home
- Success and failure experiences

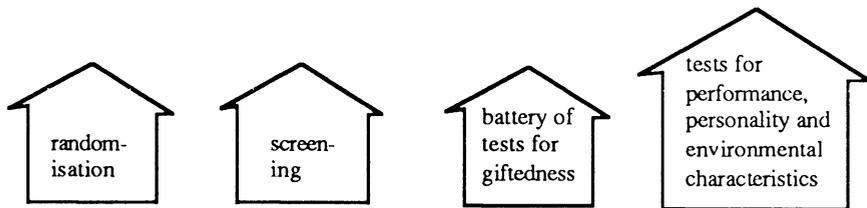
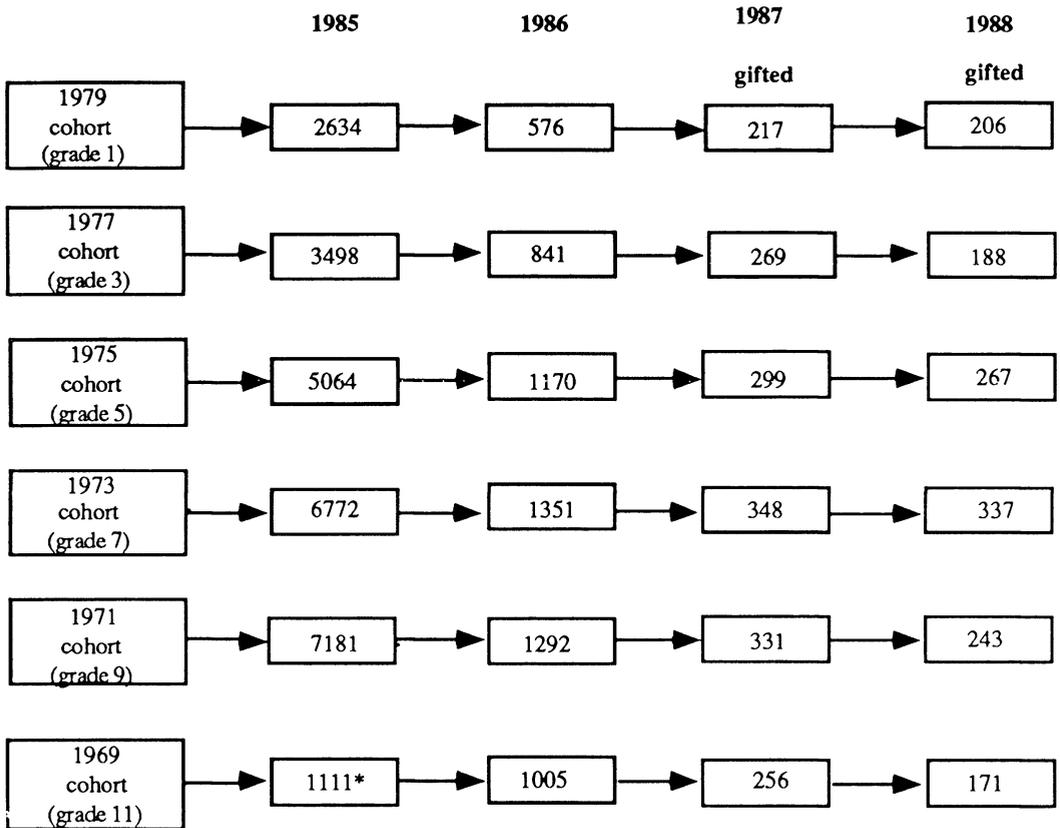
Research design

Starting from a large multiregional sample with six age cohorts between 6 and 16 years (who were 8 and 18 at study completion), data were collected on (highly) gifted students during three periods between 1986 and 1988. The study is characterized as a longitudinal/cross sectional design. The entire sample design is shown in Figure 3 (see next page).

There were two stages in the selection of the sample:

— In the first step, teachers of more than 26,000 students were requested to rate their gifted to highly gifted students according to the five dimensions of giftedness as compared to their peers.

— In the second step, about 30% of the original sample were given achievement tests and differentiated questionnaires in order to identify the top 2-5% of the students.



* Total evaluation without screening (since the 11th grade in gymnasium consists of the most gifted students)

Figure 3. *Sample design of the Munich longitudinal study of giftedness (see also Steffens & Perleth, 1990, p. 76-78)*

The most important information sources, the research variables, and the measurement instruments are summarized in Table 1 (see next page).

Table 1. Information sources and measured variables of the Munich longitudinal study of giftedness

Variables	Information Sources	
	Student's Psychometric Scores	Teacher Ratings
Intellectual Dimension	Tests: – KFT (German CAT by Heller, Gaedike, & Weinläder, 1985) – ZVT (Numbers Connection Test by Oswald & Roth, 1978)	Teachers' Checklist: Grades
Creativity Dimension	Tests: – VWT (Unusual Uses acc. to Guilford) – VKT (Verbal Creativity by Schoppe, 1975) Questionnaire: – GIFT (Group Inventory for Finding Creative Talent by Rimm, 1980)	Teachers' Checklist: – T-Cre
Social Competence Dimension	Questionnaire: – Social Competence	Teachers' Checklist: – T-SC
Psychomotoric Dimension		Teachers' Checklist: – T-PM
Art (Music) Dimension		Teachers' Checklist: – T-Mus
Noncognitive Personal Characteristics	Questionnaires: – TIK (Thirst for Knowledge by Lehwald, & Friedrich, 1987) – HS (Hope for Success) – FF (Fear of Failure) – Anxiety – Self-Concept – Attribution – Learning Styles – MAI (Munich Activity Inventory)	
Environmental Characteristics	Questionnaires: – Critical Life Events – Family Climate – School Climate	

Results

The following results from the first research phase (1986-1987) are available (cf. Heller, 1990):

(1) The five factors intelligence, creativity, psychomotor ability/practical intelligence, social competence, musical ability were found to be independent dimensions of giftedness. The hypothesis that there are **domain-specific forms of giftedness** was confirmed.

(2) The measurement instruments (see Table 1) for determining cognitive and non-cognitive personality characteristics of the gifted as well as relevant conditions of the social learning environment are reliable, even at extreme levels of giftedness. A particularly useful strategy was the use of intelligence and achievement test items for the gifted that are normally solved by students one to three years older.

(3) There were clear differences between the gifted and nongifted (i.e., average) students in every domain of giftedness. The intellectually or academically talented (so called "schoolhouse gifted", according to Renzulli) were characterized by their good grades; they were not only better than the creative (so called "creative-productive" according to Renzulli) but also than the socially or practically gifted. The creatively gifted, on the other hand, were better in art and literary areas, the socially gifted in social areas.

(4) Multiple gifted were seldom found in our sample (N = 1800). However, students (from 6 to 16 or later 18 years) who were both intellectually and creatively gifted were superior to all other students in important achievement areas. **The diagnosis of giftedness should, therefore, not continue in a unidimensional manner**, for example, using a (single) IQ cutoff score (also see Sternberg, 1990; Hany & Heller, 1991).

(5) Particularly capable students are characterized by the following: drive for achievement, willingness to exert themselves, perseverance, thirst for knowledge, research drive, inventiveness and self-assurance.

PROJECT PHASE TWO

Goals

During the second project phase, the actual longitudinal study, the focus was on developmental psychological aspects and analyses of (academic) achievements. The main goals of this project phase were:

- (1) Determination of the prognostic validity of the instruments used during the first (1986), second (1987), and third (1988) measurement periods to identify gifted students (1st to 12th grade).
- (2) Determination of the validity of the typological conceptualization of giftedness as well as interactions between different types of giftedness and achievement at various age levels.
- (3) Evaluation of the effects of personality and environmental factors on the achievement of gifted students based on our causal model (see Figure 2).
- (4) Observation, description, analysis, and explanation of the course of development in gifted children and adolescents (experimental and control group design) with regard to changes in characteristics in cognitive and noncognitive areas.
- (5) Determination and analysis of interactions among giftedness, achievement, personality, and environment over the course of time.

Results

Due to the limited space here, numerous individual results cannot be reported; for more details see Hany (1991) and Perleth and Sierwald (1991). The following results should be of particular interest with regard to practical identification and nurturing of gifted children and adolescents (also see Heller & Perleth, 1988).

Most of the test-retest coefficients for the variables of giftedness and motivation are in a central range, i.e. between .50 and .70. In order to determine the stability of the scales used in both forms (the students were given the parallel form during the second measurement period) of the German version of the Cognitive Abilities Test, the KFT (Heller, Gaedike & Weigl, 1985; also see Steffens & Perleth, 1990), the correlations between the first and the third measurement periods were calculated separately. The corresponding coefficients are almost all higher than those between the first and second measurements.

The correlational analyses of prognostic validity indicate that general intelligence (KFT total score) is an especially good predictor of academic achievement. The various KFT dimensions show — as expected — domain specific variations in the relationships to German, Mathematics, and English grades. Although the teacher checklists were very good predictors of academic achievement, no statistically significant relationships were expected or found between the other tests of giftedness, i.e. social competence, psychomotor ability, etc., and academic performance.

Multiple correlation coefficients between the various predictors were determined at measurement one (variables of giftedness, teacher checklist variables and motivation

variables) and the criterion variables at measurement two (achievement variables) in order to answer the question of predictability of domain specific achievements. Achievement and teacher checklist scores for gymnasium students only were considered, in order to avoid confounding school specific judgement systems (the frame of reference for teachers is, in my experience, naturally their own type of school). Due to the problems of colinearity within the predictor set, the standardized regression coefficients should not be over interpreted. As a whole, however, the results on prognostic validity indicate that the data do not contradict the causal model of achievement behavior, but rather are in good agreement with it. Analyses supported the hypothesis of various types of giftedness, but definite characteristic clusters of the gifted were not found; the contrary was the case (see Steffens & Perleth, 1990).

With regard to the association of family characteristics (style of upbringing, values, discipline, etc) with the adolescents' activities, only partial negative effects — for example in the 8th graders — of parental control could be determined. An association of intelligence with literary and artistic activities in the eighth grade was also found. Family characteristics such as cultural interest or joint leisure time activity planning are apparently correlated with students' activities in art and literature. There was an interesting interaction between parental control and intelligence: Whereas highly intelligent students from families with a low level of control were more active in literary areas, average students tended to develop more activities when they perceived their parents as controlling.

In the area of social activities, a negative influence was found for intelligence in older students (from the 10th grade). This is perhaps not overly surprising. An interaction was also found with regard to "control": In average students, parental control had a more positive effect on adolescents' social activities; in the highly intelligent adolescents, however, the situation was almost reversed. Taken as a whole, the gifted students seemed to be less influenced in their personality development by the family climate than the average students.

Since similar results were found regarding school climate variables such as achievement pressure, cooperation and disturbances in the classroom, the conclusion seems to be that gifted adolescents are more resistant to environmental influences than their average peers. This is consistent with recent theoretical assumptions that gifted children are much more likely to influence their social environment actively or change it to suit their needs. Such suppositions are supported by statements made by parents. They often complain about their gifted children's undying thirst for knowledge and explorative drive, about their individual, almost stubborn, behaviors or work styles, etc. It may very well be true, then, that gifted adolescents are better able to cope with systematic stresses in the family or at school simply because they are "more mature" and have a larger number of coping strategies available.

In following sections, more detailed results about the relationship between giftedness and noncognitive personality characteristics as well as various (academic and nonacademic) achievement variables will be presented. Finally, some sex related

differences will be reported. The best 6-10 percent of an age cohort will be referred to as "gifted", the best 3-5 percent as "highly gifted" and the top 1-2 percent as "extremely gifted". The data analysis was completed by my coworkers, Ernst Hany, Christoph Perleth, and Wolfgang Sierwald.

Selected typical characteristics of various groups of gifted will be presented here for the 10th grade (gymnasium) students of this study. In the intelligence group, academic self-concept in the highly gifted was significantly higher than in the gifted or normally gifted group. This is in agreement with the results of a Dutch study (Mönks, van Boxtel, & Sanders, 1986). No differences were found between the three groups of gifted with regard to general self-concept, again in agreement with Mönks et al. Despite the expected lower tendency to external causal attributions in the highly to extremely gifted, the various groups of intelligence — unexpectedly — did not differ with regard to other motivation variables (thirst for knowledge, assurance of access vs. fear of failure). By contrast, the average and gifted students could be clearly differentiated from the highly and extremely gifted students in their learning styles. The latter scored significantly lower on the scales "Planning and organizing of work" and "Control of motivation" (in the sense of Kuhl, 1983). Apparently the highly and extremely gifted have no problems with homework, so that they do not need the usual (simpler) techniques for coping with it. In addition, it was found that the highly gifted prefer to work alone and not to cooperate in groups with classmates.

The differences in characteristics were less pronounced in the creativity groups. The older adolescents could be differentiated by their academic self-concept as well as by motor control and the motivation variables "hope for success" and "thirst for knowledge". These differences were not, however, significant.

In contrast, the gifted underachievers were clearly quite different from the gifted achievers. The term "underachiever" is used here to characterize students who achieve much less well than could be expected on the basis of their intelligence. That is to say, in comparison to "achievers" (in school performance), they do not live up to their potential. The underachiever profile corresponds to that found in the literature on the subject. Underachievers generally tend to be more anxious, and their thought processes are more easily disturbed in stressful situations. They seem to attribute success more externally and failure more internally (stable), i.e. they attribute the latter to what they see as their lack of ability. The academic self-concept, that is, the subjective conviction of one's personal ability to perform academically, is clearly poorer than that of the academic achievers. This is also true of their general self-concept and their motivational control. They obtained low scores on the achievement motivation scales with regard to the variables "hope for success", a high score on "fear of failure". Their motivational structure is, therefore, very unfavorable.

Finally, certain sex-related results are of particular interest. They are summarized as follows:

(1) Girls were less frequently judged by their teachers to be the best in intellectual abilities and more frequently in musical abilities.

(2) The results of the tests of giftedness were frequently sex-dependent: Girls had — on average — poorer scores in the area of intellectual abilities, especially with regard to quantitative and practical-technical abilities. If the total score of a (differential) intelligence test is used as selection criterion — for instance to form the sample in a scientific study or in talent searches for gifted programs — the sex-specific selection effect will be apparent in the area of intelligence. The girls were, however, superior to their male peers in their information processing speed and verbal creativity.

(3) It is striking that, according to our results, girls' giftedness declined steadily with increasing age or continued schooling as compared with the boys'. Since this statement is based solely on cross sectional evidence at this point, possible cohort effects need to be eliminated before it is possible to speak with certainty about systematic developmental effects.

(4) Girls were somewhat superior to boys in academic achievement — except for mathematics and physics accomplishments, where the boys showed better performance. With regard to extracurricular activities or accomplishments, a sex-role distribution is apparent: Girls were more frequently represented in musical-artistic domains, whereas they were seldom found in scientific-technical activities.

(5) Several sex related effects were found with regard to the prediction of academic achievement. In some aspects different predictors are necessary for prognosis of very good to exceptional academic achievements for girls than for boys. Above and beyond this, test items that were primarily developed for boys, were too "difficult" for girls, whereas many girl specific items were too easy for the boys. Independently of clarifying whether girls employ other problem solving strategies to obtain excellent performances (which could not be measured here), the problem of test fairness thus arises.

(6) Highly gifted girls tended to demonstrate fear of failure rather than confidence of success. Of course, methodological artifacts cannot be completely eliminated. Girls are perhaps more likely than boys to admit to anxiety in such group studies.

(7) Initial evaluation of data on sex related differences in environmental variables, here a family climate questionnaire, indicates that no notable differences between girls and boys were found regarding self-perceived family climate. However, additional analyses are necessary before final conclusions can be drawn about environmental influences on sex roles.

(8) Extracurricular activities and achievements take place in both sexes when similar conditions exist. The more active girls tend to be closer in level of activity to other girls

than to active boys. Obviously girls are not as well able as boys to turn achievements in scientific-technical areas into social recognition.

CLOSING REMARKS AND ACKNOWLEDGEMENTS

The complete methodology and the research results, which obviously could only be presented here in an abbreviated form, will be published (in German) as a book (cf. Heller, 1991). Here the tests and questionnaires used for the identification of the highly gifted students along with the developmental psychological findings concerning special measures for the highly gifted, will be described. A follow up study of the forms and conditions of metacognitive development has been running in cooperation with the University of Leipzig (Prof. Dr. Gerhard Lehwald) since 1989, and is supported by the Volkswagen Foundation (Ref: II / 66 350).

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