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Evaluation of an elementary classroom self-regulated learning program for gifted mathematics underachievers

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The evaluation of an elementary classroom self-regulated learning program aimed at the central causes of academic underachievement is recounted. The participants of the study were 36 Fourth Grade gifted underachievers in mathematics, who were identified in a sample of 1200 students. The training program developed by Zimmerman, Bonner and Kovach (1996) was conducted within the framework of regular classroom instruction of the subject of mathematics over a period of six weeks. A number of positive training effects could be statistically confirmed. In general, the training was deemed to be suitable for interventions to reduce underachievement.

Mathematics, elementary, self-regulated learning, underachievement, gifted

INTRODUCTION

A substantial proportion of highly gifted students do not attain the levels of scholastic achievement they are capable of reaching. Terman and Oden (1947), in a follow-up to their well-known longitudinal study with gifted individuals, were able to confirm large inter-individual differences in academic and occupational achievement. This early finding has meanwhile been validated in further investigative studies (Kathena, 1992; Tannenbaum, 1984). At the same time, it is generally accepted that underachievement is one of the greatest challenges facing the practice of giftedness promotion (Peters, Grager-Loidl, and Supplee, 2000). Richert (1991) estimates that "at least 50 per cent of students identified through IQ have been designated as underachievers" (p.140). With full justification, Rimm (2003) titled one of her recent publications "Underachievement: A national epidemic", whereby the only thing one can criticise about this title is that this unfortunate situation is not just limited to North America, but is rather a world wide dilemma.

Most definitions of underachievement are based on a discrepancy between IQ and achievement measurements (Peters et al., 2000; Ziegler and Stoeger, 2003). Durr (1964), for example, defined underachievement, from the perspective of learning psychology, as a significant discrepancy between IQ and performance in the form of scholastic achievement or the results of scholastic achievement tests. However, Ralph, Goldberg and Passow (1966) had previously brought attention to the immense difficulties involved in accurately measuring the achievement potential of an individual. A consequence of this measuring problem was the tendency to draw upon operational definitions, the core of which is basically composed of well-founded appraisals of achievement potential, performance and obligatory discrepancy. For example Shaw (1964) suggested labelling a child an underachiever when his/her intellectual abilities (IQ) are measured to be among the top 25 per cent of his or her class, and his or her scholastic achievements are

below the class average. Hanses and Rost (1998) defined highly gifted underachievers as school children with an intelligence percentile of at least 96, and an achievement percentile not higher than 50. In our own studies (for example, Ziegler and Stoeger, 2003), we chose as criteria an IQ of 130 and above, and a scholastic achievement level of at least one standard deviation below this score (for a discussion of these criteria see Ziegler, Dresel and Schober, 2000). These *cut-off* points are, however, completely random. Lamentably, the lack of a consensus regarding a precise operational diagnosis of underachievement makes it impossible to introduce a standard applicable diagnostic process.

Opportunities for intervention in the school

A prevention of underachievement among gifted persons calls, first and foremost, for information about the origin of the underachievement. The causes one can attribute this phenomenon to are quite varied (Peters et al., 2000; Rimm, 2003; Ziegler and Stoeger, 2003). It can be the result of specific learning disabilities such as dysgraphia, dyscalculia, or ADHD (Grimm, 1998; Leroux and Levitt-Perlman, 2000; Rimm, 2001), which are next to impossible to sufficiently resolve in the course of normal instruction and usually necessitate the execution of specific interventions. Also, grounds which can be traced to the family environment (Baker, Bridger and Evans, 1998; Rimm and Lowe, 1988), factors of psychological development as well as factors related to chance (Feger, 1987), are difficult to influence with the typical means available in a classroom. On the other hand, a very promising starting point for intervention in the scholastic setting has already been identified by Terman and Oden (1947). Supported by data collected with retrospective questionnaires filled out by participants in their longitudinal study on giftedness, they postulated that the primary reasons for scholastic underachievement could be attributed to motivational factors. The opinion that motivation plays a central role here is also shared by other researchers (for example, Butler-Por, 1993, Rimm, 1986; Ziegler and Stoeger, in press), though a number of other risk factors are also clearly significant. Counted among these are, without a doubt, deficient learning and work habits (Keller, 1993; Reis and McCoach, 2000), low control conviction levels (Tacke, 1995), and a poor ability self-concept (Rost and Hanses, 1994). A glance at the large number of possible causes here makes clear that the development of a homogeneous interventionist approach which aims to modify several central causes in the scholastic environment at the same time appear to be extremely difficult. Admittedly, the additive application of several interventionist programs, each focusing on a specific cause, would require excessive expenditures. For this reason we can justify trying out a form of intervention which is appropriate for the improvement of the central causes of underachievement which can be influenced in the classroom in the first place, and is obligated to providing underachieving students with strategies which deliberately act to eliminate the causes of their underachievement in the second place.

Extremely promising in our eyes is an improvement in the skills in self-regulated learning, whereby self-regulated learning is understood as "[...] an active, constructive process whereby learners set goals for their learning and then do monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and contextual features in the environment" (Pintrich, 2000, p.453). Similar definitions have been offered by scholars such as Butler and Winne (1995) and Zimmerman (2000). Educational psychologists subscribing to the theory of self-regulated learning believe that an improvement in this central ability also induces a series of other positive effects. For example, an improvement in learning strategies and control convictions may occur, since the results of learning are made more feasible through students' own efforts. In addition, this could have positive effects on motivation and self-concept.

Zimmerman et al. (1996) suggest a cyclical model of self-regulated learning, which consists of four phases. In the first phase a self-evaluation is conducted in which the students make an

assessment of their present performance behaviours against the background of their earlier achievements. In the second phase they analyse the learning tasks at hand, set specific learning goals and decide which strategies they want to engage in order to make the learning goals attainable. In the third phase they apply these strategies and monitor their learning progress. In some cases adjustments may need to be made in the strategy. In the last phase a connection must be drawn between the resulting learning success and the applied strategy in order to make an assessment of the effectiveness of the strategy. In conclusion the students return to the first phase of the cycle and re-evaluate their performance levels. In accord with this theoretical model, the authors have – on the basis of Zimmerman et al. (1996) – developed a training program (for a detailed description, see below). This appears to be capable of improving not just one of the causes of underachievement mentioned above – inadequate learning and work behaviour (Keller, 1993; Reis and McCoach, 2000). The training also aims to enable realistic appraisals of one's own strengths and weaknesses, an improvement in self-concept as well as improvements in motivation and control. Furthermore, it permits an individualised training approach, whereby the students act as managers of their own learning, in that they actively attempt to improve their own weaknesses.

EMPIRICAL STUDY

The aim of our study was to evaluate the self-regulated learning training program for gifted students who are underachieving in math (Zimmerman et al., 1996). There are indicators that support the expectation that this highly convincing training program will prove to be effective (Zimmerman, 2000; Zimmerman et al., 1996), but they are mainly based on the experiences of teachers and systematic empirical studies are not available.

The training program was conducted in scholastic instruction in the subject of mathematics with fourth grade students. This subject was selected for two reasons. Following the fourth grade a decision is made as to the type of school in which a student will continue his education.[1] On the basis of their talent, gifted students should be sent to a Gymnasium in which the approximately 25 per cent strongest students, with respect to prior performance, are educated. The decision for acceptance to the Gymnasium is mainly made on the basis of grades attained in the subjects of mathematics and German, so underachievement in one of these two subjects has significant consequences. A further rationale for the decision to choose mathematics was that the indicators assessed in the evaluation are highly domain specific (for example, motivation, self-efficacy) and, in contrast to the subject of German, suitable and reliable measuring instruments had been already developed.

Design and participants

The 36 underachievers who took part in the investigation were identified with a discrepancy between their score on an IQ test and their performance in the subject of mathematics. They are a sub-population of a random sample that consisted of about 1200 students. The investigation only considered gifted underachievers whose score on the Raven's Standard Progressive Matrices (SPM) (Heller, Kratzmeier, and Lengfelder, 1998), came to 130 or above. The gifted students were then classified as underachievers if their z-standardised report card grade in the subject of mathematics was at least one standard deviation below their z-standardised IQ score on the SPM. Out of the total of 36 underachievers identified with this criterion, 15 (8 girls, mean age (M) =10.50 years, SD=0.53; 7 boys, M=10.42 years, SD=0.53) were in the classes that received the training. Twenty-one subjects (9 girls, M=10.13 years, SD=0.35; 12 boys, M=10.67 years,

[1] In the German public school system, after attending primary school, students are assigned to attend one of three school formats, according to scholastic achievement. The Hauptschule (lower achievement level), the Realschule (middle achievement level) or the Gymnasium (higher achievement level).

SD=0.65) were in the classes, which did not receive the training. Random selections were made as to which of the classes were to receive the training. Participation in the study was voluntary and required parental permission.

The training was conducted at the beginning of the second half of the fourth grade. This phase is extremely significant from the perspective of the students, since they are preparing for a test, which will play a critical role in the decision of whether or not they can attend the Gymnasium. The evaluation used a pre-test, post-test design, whereby the first assessment took place about one week before the training and the second assessment ca. one week after the training.

Description of the training program

The training was administered by 12 teachers, within the framework of normal classroom instruction. This of course means that other students attending these classes also received this training; however, the focus of our analyses will remain on the gifted underachievers. The 12 teachers were randomly chosen from a pool of 25 teachers who had volunteered to participate in the study. The classes of the remaining teachers served as the control group. The teachers attended a three-day seminar that was conducted by the authors of this report. On the first day the theoretical groundwork of self-regulated learning was presented. The second day was dedicated to the topics of time management and behaviour patterns relevant to home study, and exercises related to self-regulated learning were also conducted. In addition, all learning materials relating to the training were distributed and discussed. On the third day the teachers worked together to conceptualise 30 sets of exercises, six mathematics quizzes (see below) and a comprehensive final exam, which was to be completed by all students in all classes. The intention of this exam was to provide an indicator of the success of the training.

The content of the training addressed the abilities associated with time management and the preparation of classroom materials at home (for more details and the materials see Zimmerman et al., 1996). The training itself was conducted over a six-week period: In the first week the students were to recount their own learning behaviors on standardised forms. For example, entries were made as to when and for how long the student studies, what kinds of breaks are made, what types of distractions are present, if the student studies alone or with partners and where this study takes place. Additionally, these forms had room for the students to both predict how well they expected to do on the homework exercises and the “Math Quiz” and then to later record the actual results.

From the first day of the training the students received exercises to be completed at home on which they could score up to 10 points, which were based on the topics currently being covered in the classroom. A grade in the traditional sense was not made. These daily homework exercises were composed by the teachers taking part in the study, whereby consideration was taken to insure that these exercises were standardised to the same level of difficulty, in order to maintain that effective learning/or less effective learning could be directly reflected by the performance on these exercises. The students were able to inspect the exercises at the end of the periods in which the material was covered, and were to estimate how many points they thought they would be able to attain. Additionally, at the end of each week a math quiz, which covered the subject matter discussed that week, was given during the classroom period. Once again the students had the opportunity to attain 10 points per quiz and the difficulty level remained appropriate for the achievement one would expect of a student who did not undergo this training.

After the first training week the students were in possession of an outline of their homework behaviour skills for the prior week, their daily achievement levels on the exercise sets and their score on the weekly math quiz. At the start of the second training week the teachers addressed the entries made in the first week during the class period. They drew a relationship between the quality of the homework behaviour skills and the performances on the exercise sets and quizzes

and gave hints on how the homework skills could be improved. The students were then to set achievement goals (for example 6 out of 10 points on the next exercise sets or 5 out of 10 points on the next math quiz), which were then recorded in the materials prepared for them. They were also to record which strategic methods they intended to engage in order to attain these achievement goals. In addition to the clues given by the teachers, leaflets on effective homework skills, which had been distributed among the students contained tips on how to organise a workplace, regulate study time and breaks, and deal with distractions.

In the records for the second week, for which the students once again received standardised forms, the students were to describe, among other things (1) the goals they had set for themselves and the (2) strategies they chose to engage in order to attain these goals. As they had already done in the first week, the students were to continue to record (3) their daily scores on the exercise sets (both the predictions they made in school after viewing the exercise sets for the first time and the actual scores attained after working through the exercises at home) as well as those for the (4) math quiz. Since (5) analogue to the documentation made for the first week, the learning behaviours with respect to home study were also recorded, (6) notice was also taken as to how well the implementation of the chosen learning strategy supported the attainment of the goals set. Thereby the students were able to establish a relationship between the effectiveness of their strategies and their learning performances.

At the start of every subsequent training week, discussions were held with the students on examples of effective as well as ineffective learning strategies. Each student continued making specific goals for the coming week and making concrete decisions for, in his/her opinion, suitable learning strategies needed to meet these goals. The completion of the homework exercises, the math quiz and the filling out of the materials was formulated analogue to the procedure followed for the second training week.

MEASUREMENT INSTRUMENTS

Since interests, attitudes and self-related cognitions about a particular topic assume a high degree of domain specification, measuring instruments specifically designed for the domain of mathematics were put to use. The study participants evaluated statements on various subjects along a six-point Likert scale. The assessments were conducted as paper and pencil tests during regular mathematics instruction, under the supervision of the class teacher and required approximately 40 minutes to complete, including instructions. The test to assess mathematics achievement was conducted separately and also took about 40 minutes to complete. The ability levels of the students were assessed with the assistance of the Raven Test (Standard Progressive Matrices, SPM; Heller, Kratzmeier, and Lengfelder, 1998).

Time management and self-reflection of own learning

In order to assess the constructs time management and a self-reflective approach to one’s own learning process, use was made of two subscales derived from the questionnaire “How do you learn?” developed by Gold and Souvignier (2000). This measuring instrument unifies items found in the questionnaire LIST (Lernstrategien im Studium [Learning strategies for university studies]) developed by Wild and Schiefele (1994) with questions out of the KSI from Baumert (1993) and WLI from Metzger, Weinstein and Palmer (1994). Both scales were adapted for the present investigation so that they could be answered along a six-point Likert scale, whereby the endpoints were marked with the statements (1) very seldom and (6) very often.

The scale used to measure skills in time management consisted of eight items. Sample items are: *Prior to every learning unit I establish a specific period of time for it. I always determine how far I want to proceed in the learning material before I start to study. I follow a specific time plan*.

Cronbach´s α for the two measuring points came to 0.68 and 0.71. The scale used to assess self-reflection of one's own learning consisted of four items. Sample items: *When I am studying math and don't understand everything, I try to determine where my difficulties are coming from. When I am studying math and a specific point seems to be confusing and unclear, I change my methods in order to get a better grip on the larger difficulties*. Cronbach´s α for the two measuring points came to 0.73 and 0.75.

Self-efficacy. In order to assess the expectations the students had of how successfully they will come to terms with future challenges in the subject of mathematics, five new items were constructed, since scales previously applied (Ziegler and Stoeger, 2002) proved, in a pilot study, to be inappropriate for children attending the fourth grade. Three of these deal with the expectation to be able to maintain good evaluations of their performances (sample item: *In the future, I will certainly not perform as well as most of the others in math*), the remaining two items intended to subjectively determine to what degree the students believed that they could attain learning gains (sample item: *In the future, I will certainly learn a lot of new things in math*). The items were assessed along a six-point Likert scale with the poles (1) 'absolutely disagree' and (6) 'agree completely'. The analyses of the internal consistencies of the scale (first measuring point: α=0.76, second measuring point: α=0.83) yielded satisfactory results.

Willingness to exert effort: The willingness of the students to exert effort was measured with a comprehensive, self-developed eight-item scale, which had already been verified in other studies. The scale offers insight into the amount of effort students apply to their learning (sample items: *I spend a lot of time at home doing math exercises* and *I only do my math exercises when I feel like it*). Cronbach´s α for the two measuring points came to 0.80 and 0.83.

Helplessness: The degree of helplessness was assessed with four items taken from the Helplessness Scale (HiS) advanced by Breitkopf (1985). The items were to be assessed along a six-point Likert scale with the poles (1) 'disagree completely' and (6) 'agree completely'. This scale appraises anxiety *(I cannot think clearly in school)* as well as the self-perceived non-contingency of ones own actions and the consequences of these actions *(for example, Even when I study a lot, I still won't be good in school).* Cronbach´s α of the scale came to a satisfactory 0.93 (first measuring point) and 0.96 (second measuring point).

Aspiration level for the subject of Mathematics: Aspiration levels for the subject of mathematics was measured with the question, with which grade on the next examination in mathematics would you be satisfied.

Scholastic achievement: The test designed to measure scholastic achievement was developed by all teachers who either led a class participating in the training or one of the classes, which was a member of the control group. The content of the test was based on the material covered in the classes during the six-week training period, and validity and comparability among the various classes was closely monitored. For example, no question formats were included which had not yet been introduced in all classes participating in the study. The internal consistency of the 14 items comprising the examination gave α=0.76.

Ability Level: The ability levels of the students were measured with the assistance of the Raven Test (Standard Progressive Matrices, SPM; Heller et al., 1998). The test was chosen for three reasons: First, the Raven has very good psychometric properties. Second, because it is a group test it is very economical. Third and most important, the Raven test shows high correlations to other intelligence tests (cf. Heller et al., 1998), which is why the results can be considered as representative. Students are referred to as underachievers when their z-standardised intelligence quotient was calculated to be at least one standard deviation higher than the z-standardised grade in mathematics in their most recent report card.

RESULTS

In order to examine the effectiveness of the training, an analysis of variance (ANOVA) with repeated measurements was calculated with group membership (training vs. control group) as the independent variable. Due to the small sample sizes, non-parametric statistics were also calculated. Since these led to the same results, further detailed descriptions are not provided. Although gender was able to generate main effect significance, this was not repeated within an interaction, and therefore it is not subjected to further considerations.

The actual aim of the training was to promote the skills involved with time management and the overriding goal was to bring about an improvement in self-efficacy and self-reflective learning behaviors. Marginally significant training effects could be reported for all three of these areas (time management: $F_{(1,30)}=2.82$, $p=0.05$; self-efficacy: $F_{(1,30)}=1.97$, $p=0.08$; self-reflective learning behavior: $F_{(1,30)}=1.82$, $p=0.09$). Time management abilities and self-reflective learning behaviors increased slightly between the two measuring points in the training group, while a decrease was observed in the control group. The training also led to an increase in self-efficacy for the training group. No change in self-efficacy could be confirmed for the control group between the two measuring points. The mean values and standard deviations calculated for both measuring points as well as the effect sizes are specified in Table 1. With regard to willingness to exert effort – contrary to our expectations – no training effect could be identified ($F_{(1,30)}=0.66$, $p=0.21$). The training proved to have an astonishing effect on the perceived level of helplessness among the underachievers examined ($F_{(1,29)}=4.06$, $p=0.03$). While the perceptions of helplessness among the students in the control group stayed just about the same from measuring point one to measuring point two, those for the training group sank sharply (see Table 1). No significant training effects could be isolated for aspirations regarding the next mathematics exam or on the grades attained on the mathematics examination taken following the training (aspiration: $F_{(1,27)}=1.68$, $p=0.10$; mathematics examination score: $F_{(1,30)}=0.81$, $p=0.19$). The correlation between aspiration and mathematics exam results for the training group were with $r=0.66$ significantly positive ($p<0.05$), while in the control group with $r=0.36$ statistical significance was not attained ($p>0.10$).

Table 1. Means, standard deviations and Δ's by cluster membership and treatment

		t_1	t_2	Δ
Time management	Treatment	2.38 (0.85)	2.58 (1.04)	0.20
	Control	2.54 (1.17)	2.14 (1.17)	–0.40
Persistence	Treatment	4.02 (0.68)	4.06 (0.78)	0.06
	Control	3.93 (0.74)	3.78 (0.93)	–0.22
Self-reflection of own learning	Treatment	3.52 (0.95)	3.67 (1.02)	0.15
	Control	3.88 (1.14)	3.50 (1.21)	–0.37
Helplessness	Treatment	2.13 (1.05)	1.69 (0.82)	–0.44
	Control	1.82 (0.87)	1.75 (0.76)	–0.07
Self-efficacy	Treatment	4.45 (0.72)	4.67 (0.65)	0.31
	Control	4.95 (0.66)	4.91 (0.55)	–0.06
Aspirations*	Treatment	3.00 (0.67)	2.92 (0.67)	–0.13
	Control	2.79 (0.66)	2.90 (0.63)	0.17
			Factor: F(1,27)=0.02, p=0.45	
			Interaction: F(1,27)=1.68, p=0.10	
Achievement*	Treatment	2.90 (0.76)	2.87 (1.13)	–0.04
	Control	2.28 (0.66)	2.53 (0.77)	0.32

All scales are based on Min=1 and Max=6.
* Achievement and Aspirations scaled inversely.

DISCUSSION

The causes of underachievement are diverse and therefore they cannot all be addressed successfully and to the same degree in a classroom setting. The training we chose to apply, developed by Zimmerman et al. (1996) did, however, exercise the appropriate objective of having

a positive influence on causes seen as being central to the issue and easily alterable within the scholastic environment.

Unfortunately, the assessment of training results was made difficult by the rather small number of underachievers in mathematics who could be identified in a sample of about 1200 students. This means that the risk of a β error is very high, that is, that actual differences may not be recognised as being statistically significant. In fact, we suspect that this was indeed the case in the present study. Even though every single indicator of the training showed improvements within the training group in comparison to the control group, only four of seven differences were statistically significant. A look at the figures for Δ_{Change} reveals, however, that several of the non-significant differences did reach considerably large proportions.

The direct content of the training dealt with time management and strategic learning. Significant improvements could be identified after the training in both of these areas. A preliminary conclusion is, therefore, that the training was able to reach the immediate goals envisioned for the underachievers. In this regard, one of the most important causes of scholastic underachievement (Keller, 1993) was successfully intervened.

Two further, rather indirect goals of the training could also be realised. According to Zimmerman et al. (1996), self-efficacy should also be raised through the training program. Aspects of the training, which sustained this goal, were the numerous measurements of achievement which (1) were coupled with opportunity to exercise realistic self-assessments and to which (2) a feedback was tendered. In this way, it was possible for the students to draw a connection between their own learning processes and the resulting performance. This should then be effective in reducing causes of underachievement such as unrealistic self-assessments, low control convictions and helplessness (Heller and Ziegler, 1996; Rost and Hanses, 1994; Tacke, 1995; Ziegler and Stoeger, in press). In fact, positive training results could be registered for the two scales used to measure values in this area, that is for self-efficacy and helplessness. Therefore the training program can be judged as being positive in this field as well.

The motivation of the students, a risk factor which several researchers consider to be central for academic underachievement (for example, Butler-Por, 1993; Ziegler and Stoeger, 2003), is also a goal of this training. The two scales we applied here referred to the establishment of challenging objectives and the persistence to pursue these objectives arduously. There were points in the training where the students were expected to develop challenging objectives, such as establishing how many exercises they wanted to correctly solve in the tests and the improvement of their learning behaviours. Since the students not only learned to set challenging objectives, but also learned that they can actually be attained, one can presume that they will now be more persistent in the pursuit of these goals. A plausible promotion of persistence is also indicated by other aspects of the training. For example, an individual reference norm was applied over the entire course of the training, which usually produces positive effects (for example, Mischo and Rheinberg, 1995; Rheinberg, Luehrmann, and Wagner, 1977). Furthermore, the entire training program is built on the basic conviction that ability is neither a fixed entity nor is it the source of learning achievement, but rather the result of learning achievement. This type of attitude should provide a positive foundation for continued persistence particularly after experiences of failure (for example, Dweck, 1999). Although the results of the study demonstrate no statistical increase in persistence among the underachievers, the training appears to provide an effective defence against a decrease. While the persistence among the underachievers in the control group decreased ($\Delta_{Change}= -0.22$), this variable remained just about constant among the underachieving students in the training group ($\Delta_{Change}= 0.06$). One reason for the lack of increase in persistence among the underachieving students could very well be due to the fact that the students received notification, shortly before our second measuring point, as to whether they had been admitted to the

Gymnasium or not. Based on poor scholastic performance, *none* of the underachievers in our investigation had received a positive notification. After taking this unique situation into consideration, one gains a bit more insight as to the lack of increase in persistence among the underachievers. Statistically verifiable training effects could not be confirmed regarding the selection of challenging goals and the associated aspiration level either. Positive tendencies were, however, identifiable here ($\Delta_{\text{Change control group}} = -0.16$, $\Delta_{\text{Change treatment group}} = 0.17$). In contrast, a clear-cut success of the training is that the aspirations among the students in the training group became much more realistic, a fact which is verified by the close correlations found between their aspirations and their actual scholastic performances.

The ultimate goal of the training should, however, be an improvement in scholastic performance since its relative relationship to IQ is the principle on which underachievement is defined. Unfortunately here one can only refer to the $\Delta_{\text{Change}} = 0.32$ for which, although it represents a mid-sized effect, a confirmation within a MANOVA could not be attained.

All in all, and despite the fact that some of the training effects could not be statistically confirmed, we arrive at an optimistic resumé of the evaluation. In the first place, the chances that a β error actually occurred are extremely high. Although the sample encompassed about 1200 students, only 36 underachievers could be identified in the subject of mathematics. In the second place and without exception, all changes recorded are in the direction expected. However, there is yet another argument which speaks for a positive evaluation of the training. The duration of the intervention encompassed merely a few weeks, whereby the improvement in self-regulated learning occurred only by means of time management skills training. Zimmerman et al. (1996) have, however, developed additional training modules, which are mediated with the same training procedure. The contents are composed of further skills (for example, test taking skills), and the acquisition of these skills should lead to a better internalisation of the general array of self-regulated learning skills. It is also plausible here to assume that improvements, more substantial than the effects attained in our study, are possible. This well-founded expectation should be placed under closer examination in further studies with larger samples. In view of the still outstanding studies only being preliminary – our resumé of the evaluation study is as follows: the improvement of self-regulated learning is very likely a promising foundation for interventions which would enable gifted underachievers to convert the potential they have within into more effective performances. There is nothing that speaks against, and much to support, the belief that special training programs such as that developed by Zimmerman et al. (1996) can be of great assistance here. Indeed a rather strong emphasis on self-regulated learning in regular classroom instruction would be desirable, since this type of learning would be beneficial not only for gifted underachievers, but rather for gifted students in general (for example, Neber and Schommer-Aikins, 2002).

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