Implicit Theories of Intelligence of Gifted Students in Secondary Education

Masterthesis Educational Science

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Abstract

In this study the mindsets of gifted secondary school students are explored and related to their goal orientation. People hold implicit believes about intelligence; they either think intelligence is malleable or a fixed trait. These mindsets have an impact on achievement, motivation and resilience. It is still unknown how these mindsets are related to achievement goals within the gifted population and if they can be manipulated. The aim of this study is to compare the mindsets of gifted students and their non-gifted high ability peers and relate them to the goals they pursue in school. Finally it is questioned whether they can be manipulated by educational interventions. In the current study 246 gifted and non-gifted secondary school students participate. Two self-report questionnaires are employed to measure their mindset and goal orientation. Results show a statistically significant difference in mindset. Gifted students' scores on mindset are lower than those of non-gifted students, indicating a fixed mindset. A statistically significant relation between mindsets and goal orientations is not found within the gifted sample. In the non-gifted sample positive statistically significant correlations are found between mindset and approach goal orientation (mastery and performance). Descriptive statistics reveal mean differences in mindset scores between grade one to four, however the difference between grade one and two is the only one that changes significantly in the expected direction. Gifted students mindset is more fixed compared to their non-gifted peers. It is important to find ways to manipulate the mindset of the gifted. When gifted students believe their giftedness can be developed by investing effort and persistence, they will be able to increase their performance and fully exploit their potential.

Key words: mindset, implicit theory of intelligence, goal orientation, gifted students, UniqXL education.

Introduction

"The brain is like a muscle: it gets stronger with use and can be trained to accomplish new learning by

persistent effort."

(Moon, S.M., 2012, p.172)

After many years of studying the minds of the gifted and experimenting with different

educational interventions it is still puzzling why gifted students often struggle in their educational

careers. This paper aims to investigate psycho-social factors that influence the functioning of gifted

students in secondary education in the Netherlands. Enrichment programs, ability grouping,

accelerating and summer programs are the most common arrangements to serve gifted children in the

Netherlands. An increasing amount of schools establish special departments for educating gifted

children. The special needs of this population are acknowledged by people working in the field of

gifted education and in politics (Dekker, 2013; Mooij, Hoogeveen, Driessen, Van Hell, & Verhoeven,

2007). Nevertheless the effects of these measures on achievement, self-efficacy and motivation are not

unequivocal (Mooij, et al., 2007). This indicates that more research in the field of gifted education is

needed.

In recent work Subotnik, Olszewski-Kubilius and Worrell (2011) stress the importance of

challenging schoolwork and appropriate educational programming, training and support as essential

factors in developing a students' talents and abilities. However, in their opinion research should not

only address educational issues, but also contribute to our understanding of major psychological

concepts such as mindsets, self-regulation, resilience and stereotyping of gifted children (Sutbotnik, et

al., 2011).

In the eighties, Dweck and Leggett (1988) first mentioned the mindset concept. In their work

they distinguish two categories of individuals by their perception of intelligence. The first category of

individuals conceptualize intelligence internally as something malleable. They believe that people

possess a certain level of intelligence. However, this is not a stable trait, rather it is something that can

change over time. By investing effort and persistence intelligence can grow. In other words: these

individuals have a *growth mindset*. The other category of individuals conceptualize intelligence as a

stable personal factor. In their opinion people can learn new things, but that does not change their

basic intelligence. These individuals have an entity view of intelligence and this is called a *fixed mindset*. In short, people are either incremental theorists or entity theorists. These so called implicit theories of intelligence orient individuals towards different goals and explain the underlying psychological processes of a social cognitive approach to motivation: goal orientation (Dweck & Leggett, 1988). Children's conception of intelligence influences their motivation. For example when they fail to perform on a difficult task they can either think that working harder the next time is the best strategy to improve their performance or they give up, because they think they are not smart enough to master the task. Goal orientation theory focusses on a child's reason to achieve and is one of the most influential motivation theories of the last few decades. Since motivation is one of the key factors for developing gifts into talents (Clinkenbeard, 2012; Mönks & Ypenburg, 1995; Renzulli, 2002) it is relevant to further explore this construct within the context of gifted education.

The Gifted

There is no general agreement on the definition of giftedness. In recent work Subotnik et al. (2011) compose a comprehensive definition of giftedness.

> Giftedness is the manifestation of performance or production that is clearly at the upper end of the distribution in a talent domain even relative to that of other high-functioning individuals in that domain. Further, giftedness can be viewed as developmental, in that in the beginning stages, potential is the key variable; in later stages, achievement is the measure of giftedness; and in fully developed talents, eminence is the basis on which this label is granted. Psychosocial variables play an essential role in the manifestation of giftedness at every developmental stage. Both cognitive and psychosocial variables are malleable and need to be deliberately cultivated. (Subotnik et al., 2011, p. 7)

This dynamic interpretation of giftedness is confirmed by other eminent researchers in the field (Driesen, Mooij & Doesborgh, 2007; Mönks & Ypenburg, 1995; Renzulli, 2002; Sternberg, 1985). Sternberg (1985) conceptualizes intelligence as an interplay between analytical, practical and creative knowledge which can be developed during a lifetime. Renzulli's three-ring-conception of giftedness shows that giftedness is the interaction between above average ability, creativity and task commitment (Renzulli, 2002). Mönks and Ypenburg (1995) add the influence of the environment to

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the model of Renzulli (2002) as an important factor of developing gifts into talents. The similarity of these conceptions of giftedness is the fact that intelligence is viewed as a malleable feature instead of a fixed trait. Research conducted by Ericsson and his colleagues (1993) shows that excellent performers do need to invest a lot of time and effort to become a genius. Personal factors (motivation, creativity, persistence) and environmental factors (peers, teachers, parents) influence the development of potentially gifted individuals.

In diagnosing children, these personal and environmental factors are often ignored. In common practice children are being labelled gifted when their intelligence quotient is at the statistically upper end of the distribution of IQ scores, that is, above 130. This discrepancy between literature and common practice is remarkable. The gifted label influences the self-perception of these children and the perception of adults surrounding them and therefore can be detrimental to the development of the gifted child (Gates, 2010; Subotnik et al, 2011). The stereotype belief that gifted children will make it on their own or perform well without effort is widespread in our culture (Subotnik et al., 2011). Also, being praised for abilities and the ease with which gifted children seem to earn high grades can also hamper their learning and do not serve them well in the long run (Dweck, 2012; Subotnik et al., 2011). Dweck (2012) points to the risk that gifted students prefer tasks that are in their comfort zone. They avoid challenging tasks because they see effort as a lack of ability. In the face of failure they engage in a variety of self-protective and avoidance behaviors to avoid not looking smart. Dweck believes this helpless response pattern, characterized by avoiding challenges, giving up easily, seeing effort as fruitless and ignoring useful feedback on mistakes, is related to a fixed mindset. It withholds gifted children from learning and reaching their full potential (Dweck, 2012). For this reason it is relevant to expose the relation between giftedness and the mindset concept. Given the aforementioned characteristics of gifted children and the negative effect of labelling it is interesting to find out if the mindset of gifted children differs from that of non-gifted children. The first aim of this study is to explore the mindset of gifted students and compare it to their non-gifted high ability peers.

Implicit Theories of Intelligence and Goal Orientation

Research by Dweck and her colleagues indicate that children with different implicit theories of intelligence, from now on called mindsets, pursue different goals (Dweck & Leggett, 1988; Elliot &

Dweck, 1988; Elliot, 2005). As shown in Table 1 children with a fixed mindset (entity theory) are

likely to pursue performance goals in which they seek to establish the adequacy of their ability and

compare it with others. On the contrary, children with a growth mindset (incremental theory) are

assumed to pursue learning goals and view achievement situations as opportunities to increase their

competence and learn new skills (Dweck & Leggett, 1988).

Table 1

Theories, Goals and Behavior Patterns in Achievement Situations

Theory of intelligence	Goal orientation	Perceived present ability	Behavior Pattern
Entity (Intelligence is fixed)	Performance (Goal is to gain positive judgments/avoid negative judgments of competence)	High Low	Mastery oriented (seek challenge; high persistence) Helpless (Avoid challenge; low persistence
Incremental (Intelligence is malleable)	Learning (Goal is to increase competence)	High or low	Mastery oriented (Seek challenge that fosters learning; high persistence)

Note. Adapted from "A social-cognitive approach to motivation and personality," by C.S. Dweck and E.L. Leggett, 1988, *Psychological Review, 95 (2),* 256-273.

In studying the effects of achievement goals on learning, empirical research has shown

positive effects for mastery goal orientation on learning outcomes like high levels of efficacy, interest,

positive affect, seeking challenge and high persistence, whereas performance goal orientation is

related to positive *and* negative effects (Elliot & Harackiewicz, 1996; Elliot, 1999, 2005; Pintrich

2000). Table 1 shows the influence of perceived ability on the behavior patterns of children. Children

with a fixed mindset and a high perceived ability are likely to behave mastery oriented, whereas

children with a fixed mindset and a low perceived ability show the helpless behavior pattern. To

explain this phenomenon Elliot and McGregor (2001) distinguish another dimension in the goal

orientation construct. Beside the definition of competence (using absolute or normative standards of

evaluation) valence is the other component of achievement goals. Valence is the emotional component

that can be positive (approaching success) or negative (avoiding failure). Valence explains the variety in outcomes of pursuing performance goals and results in an approach (positive) and avoidance (negative) state (Elliot & McGregor, 2001).

In sum, a fully nuanced 2 x 2 framework resulting in four different goal orientations is constructed and empirically tested by the authors (see Table 2).

Table 2

The 2 x 2 Achievement Goal Framework

		Definition	
		Absolute/intrapersonal (mastery)	Normative (performance)
Valence	Positive (approaching succes)	Mastery-approach goal	Performance-approach goal
	Negative (avoiding failure)	Mastery-avoidance goal	Performance-avoidance goal

Note. Adapted from "A 2 x 2 Achievement Goal Framework" by A.J. Elliot & H.A. McGregor, 2001, *Journal of Personality and Social Psychology, 80* (3), 501-519.

Within this framework four goal orientations can be differentiated: mastery-approach goal orientation (mastering a task, understanding), mastery-avoidance goal orientation (avoiding misunderstanding or not mastering a task), performance-approach goal orientation (being the best compared to others) and performance-avoidance goal orientation (avoid looking stupid). The mastery-avoidance goal orientation category is the most difficult category to interpret and is presumed to be less prevalent than the other categories (Elliot, 2005). Mastery-avoidance goal orientation differs from mastery-approach goal orientation in terms of valence and differs from performance-avoidance goal orientation in terms of definition. Elliot and McGregor (2001) have shown that mastery-avoidance goal orientation does not have the same positive effects on achievement as mastery-approach goal orientation because of the focus on a potential negative outcome. Still it has more positive effects on achievement than performance-avoidance goal orientation.

Van Aarle, Van Bemmel, and Dethmers (submitted for publication) include all four categories in research on gifted children in primary education and their results indicate the clear presence of

mastery-avoidance goal orientation in gifted children. Additionally, they have shown that mastery-avoidance goal orientation is a statistically significant predictor of emotional and behavioral disaffection in gifted primary school children. Therefore it is important to include this category in goal orientation research related to the gifted population.

Although Dweck and Leggett (1988) relate the two different goal orientations (mastery and performance) to the mindset of children, no research has been conducted on the relation between these variables using the 2 x 2 goal orientation framework within the gifted population. Elaborating on this it is conceivable that a fixed mindset is connected to a performance-avoidance goal orientation and not to a performance-approach goal orientation. This study could reveal relations between mindset and all four goal orientation categories and outcomes can contribute to the existing knowledge on the specific characteristics of motivational believes of gifted children. Furthermore, the outcomes of several other studies on the relation between mindset and goal orientation, especially performance goals are not straightforward. Dupeyrat and Mariné (2005) mention several studies on implicit theories of intelligence and goal orientation with mixed results. Roedel and Schraw (1995) for example found a relation between a fixed mindset and performance goals, but rejecting the idea of a fixed mindset was independent of mastery goal orientation. Empirical research by others only indicate weak and non-significant correlations between theories of intelligence and goal orientations (e.g. Stipek & Gralinski, 1996; Bråten & Strømsø, 2004). Dupeyrat and Mariné themselves found that goal orientations were mediators between implicit theories of intelligence and learning behavior although the relations were very weak. They conclude that the two constructs (implicit theories of intelligence and goal orientations) are very unstable over different studies (Dupeyrat & Mariné, 2005). This study could contribute to a better understanding of the relations between mindset and goal orientations in gifted and non-gifted populations.

The second aim of this study is to explore the goal orientations of gifted and non-gifted students in secondary education and investigate the relationship between goal orientations and mindset in both populations.

UniqXL

The context of this study is one of the UniqXL school departments in the Netherlands. The UniqXL concept is one of the interventions for gifted children in the Netherlands in an attempt to provide an adaptive full time educational curriculum for this population. Within this concept students are grouped together with their gifted peers. In an accelerated trajectory the regular curriculum is compacted. Keywords are 'top down learning' and 'deep level learning'. Top down learning implicates learning from the explicit level (generic, declarative level) to the implicit level (specific, procedural knowledge) and is analytic in nature (Sun, Merrill & Peterson, 2001). Deep level learning is qualitatively different from surface level learning in terms of learning processes. Deep level learning occurs at the semantic level and results in a deep level of understanding (Säljö, 1981; Gibbs, Morgan & Taylor, 1982; Struyven, Dochy & Janssens, 2005). Special attention is paid to the social and psychological development of students and to self-regulatory skills. Most teachers are specialized in gifted education and are academically trained. In mentor sessions with students mastery oriented strategies (e.g. effort and persistence) are stressed because these strategies are viewed as mediators between mastery goal orientation and achievement (Dupeyrat & Mauriné, 2005). Since Dweck suggests that a growth mindset is related to mastery goal orientation, directing students to mastery goals might influence their mindset. It would be beneficial for staff members of UniqXL and other educators to find out if this specific intervention has any influence on the mindset of the gifted students over the years and if they are able to accomplish a shift in mindset from fixed to growth. Furthermore, for all people working in the field of gifted education it would be interesting to know if and how mindsets can be manipulated in order to strengthen the incremental view of intelligence in gifted students. The third aim of this study is to compare the mindset of gifted students in different grades (grade one to four) of an UniqXL school department and investigate whether there is a difference between first, second, third and fourth grade students.

Research Questions and Hypotheses

To recapitulate, three research questions are formulated in this study.

1. What mindset (fixed or growth) do first year students in secondary gifted education have and does this differ from VWO level peers in regular secondary education?

2. What goal orientation do first year students in secondary gifted and non-gifted education have and how does it relate to their mindsets?

3. Is there a difference in mindset between first, second, third and fourth grade students in a UniqXL department of a secondary school?

Based on Dweck's mindset theory (2012), the hypothesis is that the score on the mindset items of gifted students will be lower (indicating a fixed mindset) than the mindset score of their VWO-level peers.

For the second research question no hypotheses are defined. Due to the explorative character of the research question and the conflicting results of other studies it is not appropriate to have expectations in a particular direction.

Because special attention is paid to mastery oriented strategies within the UniqXL curriculum a difference in mindset comparing first to fourth grade students in the UniqXL department of a secondary school is predicted. It is expected that the mindset of students in ascending grades will shift from fixed to growth.

Method

Participants

Participants in this study were 246 students in secondary education. Four schools out of eight that were mentioned on the UniqXL website participated in this study. The reasons for rejection of the other schools were divers. One of the schools was already enrolled in a research program of another University. A second school only started with the UniqXL concept last September and did not want to annoy their students with yet another questionnaire. Two other schools specified the workload of staff and students as the reason for not participating. The four participating schools were located in Dronten, Zevenaar, Deurne and Den Helder. The sample of research question one consisted of 194 first grade students; 92 females and 101 males ranging in age from ten to 14 years, with a mean age of 12.37 (SD .61). Gender of one participant was unknown. A part of this sample ($n = 42$) was labelled gifted (IQ $\geq$ 130) and attend special departments for gifted students of their schools (UniqXL). The other part ($n = 152$) were high ability students who attend the regular VWO department of the schools concerned with this research. Dronten was the only school which separated the gifted children from

the regular VWO students in special classes. The other schools worked with mixed classes for practical and financial reasons.

For research question three, 21 first grade, 17 second grade, 27 third grade and 8 fourth grade students participated. The sample consisted of 35 females and 37 males, ranging in age from 11 to 16 years with a mean age of 13.70 (*SD* 1.22). They all attended the UniqXL department in Dronten. This was the only school with separate UniqXL classes in grade one to four.

Instruments

Implicit theories of intelligence. For measuring implicit theories of intelligence Dweck and Henderson (1988) developed a three item questionnaire (Chiu, Hong, & Dweck, 1997; Chiu, Dweck, Tong, & Fu,1997; Levy, Stroessner & Dweck, 1998). The items are: "You have a certain amount of intelligence and you really can't do much to change it", "Your intelligence is something about you that you can't change very much" and "You can learn new things, but you can't really change your basic intelligence." The answers were scored on a six point Likert scale ranging from "totally disagree" to "totally agree". The items were translated into Dutch by the researcher. The small number of items (only three) to measure the construct could be a threat to validity because internal reliability is positively related to the number of items. The reason for using three items only is that the construct has a simple unitary theme and all items are intended to have the same meaning. A continued repetition of the same idea becomes somewhat bizarre and tedious to the respondents. This questionnaire was used in several studies by Chiu et al. (1997) and Levy et al. (1998) and alpha's were high, ranging from .94 to .98 for sample sizes ranging from 32 to 184 across several studies, indicating that the small number of items is not a problem. Also test-retest reliability was found to be high (Hong, Chiu, Dweck, Lin & Wan, 1999).

However, when piloted in this study on Dutch first grade secondary school students (*n* = 56), Cronbach's Alpha was low (.32). An explanation is that students tend to vary their answers and for that reason they did not answer univocally on three items with the same underlying construct. On the basis of the pilot study two adjustments were made in the construction of the questionnaire. First, the items and their six point Likert scale were changed into a continuum of a fixed mindset item and its growth mindset counterpart on a six point scale (see Table 3).

Table 3

Items and their Counterparts of the Mindset Questionnaire.

Item	Fixed mindset	Growth mindset
1.1	You have a certain amount of intelligence and you really can't do much to change it.	You can always substantially change how intelligent you are.
1.2	Your intelligence is something about you that you can't change very much.	No matter who you are, you can always change your intelligence level.
1.3	You can learn new things, but you can't really change your basic intelligence.	You can even change your basic intelligence substantially.

Note. The fixed items were adapted from Dweck & Henderson (1988) and the growth items were retrieved from http://www.mindsetonline.com/testyourmindset

Second, during the instruction respondents were told that some questions are rather similar, but necessary in order to obtain a clear impression of their opinions. When piloted again on Dutch first grade students (*n* = 49) Cronbach's Alpha was .64, which is a reasonable improvement. In this revised questionnaire respondents were asked to show their degree of agreement on this continuum on a six point scale with a low average score indicating the participant holding an entity view of intelligence (fixed mindset) and a high average score indicating an incremental view of intelligence (growth mindset).

The adjusted mindset questionnaire was tested for reliability on the research data of the gifted and non-gifted samples. Cronbach's alpha for the three item questionnaire was .80, which can be considered good for the purpose of this study. Principal Component Factor analysis identified a single factor which accounted for 72.30 percent of the variance. This confirmed the proposed simple unitary construct.

Goal orientations. In order to measure all four goal orientations the Achievement Goal Questionnaire-Revised (AGQ-R) of Elliot and Murayama (2008) was used. This self-report questionnaire consists of twelve items, three on each construct (mastery-approach, mastery-avoidance, performance-approach and performance-avoidance). When the original version of the AGQ (Elliot & McGregor, 2001) was revised, special attention was paid to the reformulation of the items. Two

important changes were the removal of words indicating a value or concern rather than a goal per se (e.g. "it's important for me…" or "I worry that...") and the explicit articulation of the social aspect (relation to others) of the performance approach and performance avoidance items. The questionnaire was translated into Dutch and piloted on Dutch first grade students ($n = 49$) by the researcher. Reliability for three categories was sufficient with Cronbach's alpha ranging from .64 to .85. For one category (performance-approach) reliability was insufficient (Cronbach's alpha = .51). Factor analysis (principal component with oblimin rotation) on the pilot data identified four distinct factors (mastery-approach, mastery-avoidance, performance-approach and performance-avoidance) which together explained 69.66 percent of the variance in the pilot data.

The items on mastery-approach goal orientation measure the degree of motivation to master the task (example item: *My aim is to completely master the material presented in this class*). For mastery-avoidance the important factor of measurement is to avoid not mastering the task (example item: *My aim is to avoid learning less than I possibly could*). The items of performance-approach goal orientations measure the focus on being better than others (Example item: *My aim is to perform well relative to other students)*, whereas performance-avoidance focuses on not looking stupid in comparison with others (example item: *My aim is to avoid doing worse than other students*). The answers were scored on a seven point Likert scale ranging from "not at all true for me" to "very true for me".

The data of the Achievement Goal Questionnaire-Revised (Elliot & Murayama, 2008) was tested for reliability purposes. Table 4 shows that internal consistency of all four subscales proved to be good with Cronbach's alpha ranging from .78 to .86.

An exploratory factor analysis was conducted on the 12 items to confirm the distinction of the four achievement goal constructs. Because the constructs were not totally independent (with relations between the shared components of valence and definition) an oblique rotation (direct oblimin) was selected. Initial factor analysis yielded eigenvalues over Kaiser's criterion of one for three factors which together explained 68.23 percent of the variance. The scree plot was unambiguous because the mastery-approach and mastery-avoidance goal orientation items were loading substantially on the same factor.

Tabel 4

Internal Consistency of the AGQ-R

	Variable	n	α
1.	Mastery-approach	193	.79
2.	Performance-approach	192	.86
3.	Mastery-avoidance	193	.78
4.	Performance-avoidance	193	.83

A second factor analysis was run with four components which explained 75,14 percent of the variance and showed a distinct image of four separate constructs, displayed in Table 5. Component 1 represents performance-avoidance goal orientation, component 2 mastery-approach goal orientation, component 3 mastery-avoidance goal orientation and component 4 performance-approach goal orientation.

Table 5

Factor Loadings for Exploratory Factor Analysis With Oblique Rotation of Achievement Goal Items

	component			
Item	Performance-avoidance	Mastery-approach	Mastery-avoidance	Performance-approach
Pav2	**.85**	.04	.11	.16
Pav1	**.76**	.08	-.10	.02
Pav3	**.69**	-.15	-.06	.32
Map1	.08	**.84**	.08	.04
Map2	-.21	**.83**	-.08	.15
Map3	.12	**.82**	-.02	-.11
Mav1	-.07	-.08	**-.93**	.04
Mav2	-.01	.06	**-.87**	.10
Mav3	.39	.17	**-.54**	-.25
Pap1	.00	.06	-.10	**.86**

Pap2	.13	.11	.03	**.82**
Pap3	.14	.00	.00	**.80**

Note. $n = 189$. Factor loadings > .40 are in boldface. Pav = performance-avoidance; Map = mastery-approach; Mav = mastery-avoidance; Pap = performance-approach.

In sum, both reliability analysis and factor analysis confirm the AGQ-R was a consistent and reliable instrument for measuring all four goal orientations.

Design and Procedures

All data was collected by the researcher herself. The researcher visited four schools for secondary education with a UniqXL department spread throughout the Netherlands. All students were asked to volunteer without any compensation and with full consent of their parents. In Dronten parents were informed at the beginning of the school year about participation of the school in research programs. At the other participating schools parents were informed by a letter. They were given the opportunity to object to participation of their child. None of the parents actually did this. Questionnaires were filled out by the participants during class after a brief instruction by the researcher. It was emphasized the questionnaire was not a test and would not interfere in any way with school grades. In most sessions the teacher was present in the classroom. The questionnaires were collected by the researcher and it was stressed that the data is accessible to the researcher only.

Analysis

All data was analysed and missing cases were excluded list wise, because of the limited number of items in the Mindset Questionnaire and the limited number of items per construct in the AGQ-R. For mindset and goal orientations means were calculated. To test the first hypothesis the Mindset Questionnaire was analysed for reliability and descriptive statistics were provided. In order to compare groups (gifted students in UniqXL education and regular VWO students) an independent sample *t*-test was run on the data of all first graders. De scale's midpoint was 3.5. A mean mindset score under the scales' mindpoint indicated a fixed mindset and a mean mindset score above the scales' midpoint indicated a growth mindset. Percentages of students with a fixed and growth mindset were calculated for the gifted and non-gifted population.

With regard to the second research question the Mindset Questionnaire and the AGQ-R were used. Firstly, the AGQ-R was analysed for reliability of the four different constructs. Secondly, a confirmatory factor analysis was run on the data of the AGQ-R to secure all four goal orientation categories. After producing descriptive statistics correlations were calculated and four regression analyses were run with mindset as the independent and all four goal orientations as the dependant variable for both groups.

Finally, an ANOVA with planned contrasts was devised on a second dataset in order to compare different groups ascending from grade one to grade four at the UniqXL department. After viewing the descriptive statistics of this dataset, the ANOVA with planned contrast did not seem to be adequate. The mean mindset scores from grade three and four were descending, indicating a shift in mindset from growth to fixed. Since the hypothesis was in the opposite direction this was an unexpected finding and the ANOVA with planned contrasts seemed inadequate. An independant *t*-test to compare the mean mindset scores of grade one and two was conducted instead.

<div align="center">**Results**</div>

Research Question 1

What mindset do gifted students in UniqXL education have and does their mindset differ from the mindset of their VWO level peers in regular education? Mindset was scored on a six point Likert scale with a low score indicating a fixed mindset and a high score indicating a growth mindset. As shown in Table 6 gifted first grade students' scores on mindset ($M = 3.01$, $SD = 1.35$) were lower than those of regular VWO students ($M = 3.43$, $SD = 1.15$). The regular VWO students had a mean score near the scales' midpoint of 3.50 and the gifted students had a mean score which was substantially under the scales' midpoint.

Table 6

Descriptive Statistics for Mindset

Group	*n*	*M (SD)*	95% CI	*Min*	*Max*	*Range*
UniqXL	42	3.01 (1.35)	[2.59, 3.43]	1.00	5.67	4.67
VWO	152	3.43 (1.15)	[3.24, 3.61]	1.00	6.00	5.00

An independent sample *t*-test was used to compare both means. Levene's test was not significant, indicating that the assumption of equal variances was met. The Shapiro-Wilk test was non-significant for the UniqXL sample, but significant for the VWO data which means that the assumption of normality is violated for the VWO sample. Given the large sample size and the equal variances this moderate violation was not considered to be a problem. The difference between groups was statistically significant, $t(188) = -2.02$, $p = .02$, one-tailed. The effect size Cohen's *d* was .35 which was a small to medium effect according to Cohen's standard (Cohen, 1988). When the data was split into fixed and growth (mean scores above or under the scales' midpoint), 69 percent of the UniqXL students against 49 percent of the VWO students had a score under the scales' midpoint.

Research Question 2

What kind of goals do students in gifted and non-gifted secondary education pursue and how are these goals related to their mindset? In order to be able to answer research question two, the data of the AGQ-R was analysed for the gifted sample first. The correlations shown in Table 7 indicate a negative non-significant relation between mindset and mastery-approach, performance-approach and performance-avoidance goal orientations and a positive, but non-significant relation between mindset and mastery-avoidance goal orientation.

Tabel 7

Descriptive Statistics and Intercorrelations of the AGQ-R and the Mindset Questionnaire of the UniqXL Sample

	Variable	*M*	*SD*	1	2	3	4	5
				variable				
1.	Mindset	3.01	1.38	-				
2.	Mastery-approach	3.76	.85	-.07	-			
3.	Performance-approach	2.83	1.03	-.10	.05	-		
4.	Mastery-avoidance	3.41	1.05	.11	.78**	.18	-	
5.	Performance-avoidance	2.96	1.13	-.10	.13	.76**	.39**	-

Note. $n = 42$.
*$p < .05$. **$p < .01$

Running the regression analyses on the data of the gifted students, mindset did not prove to be a statistically significant predictor of any goal orientation: $R^2 = .01$, $F(1, 40) = .19$, $p = .66$ for mastery-approach goal orientation, $R^2 = .01$, $F(1, 40) = .38$, $p = .54$ for performance-approach goal orientation, $R^2 = .01$, $F(1, 40) = .45$, $p = .51$ for mastery-avoidance goal orientation and $R^2 = .01$, $F(1, 40) = .43$, $p = .52$ for performance-avoidance goal orientation.

Running the same analyses on the regular VWO data positive and statistically significant relations were found between mindset and mastery-approach ($R^2 = .04$, $F(1, 150) = 5.50$, $p = .02$) and performance-approach ($R^2 = .04$, $F(1, 150) = 5.48$, $p = .02$) achievement goals. Mastery-avoidance and performance-avoidance were no statistically significant predictors of mindset: $R^2 = .00$, $F(1, 150) = 0.16$, $p = .70$ and $R^2 = .01$, $F(1, 150) = 1.20$, $p = .28$ respectively. Descriptive statistics and correlations for the VWO sample were provided in Table 8.

Table 8

Descriptive Statistics and Intercorrelations of the AGQ-R and the Mindset Questionnaire of the VWO Sample

	Variable	*M*	*SD*	variable				
				1	2	3	4	5
1.	Mindset	3.43	1.15	-				
2.	Mastery-approach	3.95	.76	.19*	-			
3.	Performance-approach	3.02	1.01	.19*	.23**	-		
4.	Mastery-avoidance	3.37	1.03	-.03	.25**	.13*	-	
5.	Performance-avoidance	3.12	1.09	.09	.24**	.59**	.35**	-

Note. $n = 152$.
*$p < .05$. **$p < .01$

Research Question 3

The third research question focused on differences in mindsets in grade one to grade four of the UniqXL department of one of the participating secondary schools. First mean mindset scores for students in ascending grades (grade one to four) of the UniqXL department were calculated. Descriptive statistics were displayed in Table 9.

Table 9

Means and Standard Deviations of Students in Ascending Grades in Secondary Gifted Education

Grade	*n*	*M (SD)*	95% CI	min	max	range
Grade 1	21	2.75 (1.39)	[2.11, 3.38]	1.00	5.67	4.67
Grade 2	17	3.57 (1.32)	[2.89, 4.25]	1.33	6.00	4.67
Grade 3	27	3.32 (1.12)	[2.88, 3.77]	1.67	5.33	3.67
Grade 4	8	3.17 (.97)	[1.94, 3.56]	1.67	4.67	3.00

Scores on mindset increase from grade one to grade two, but decrease from grade two to grade three and from grade three to grade four. Considering the unexpected change of means in the opposite direction, executing the proposed ANOVA with planned contrasts would be inappropriate. Therefore an independent *t*-test was conducted to compare the means of grade one and two. This test revealed that there was a significant increase in mindset between grade one and grade two, $t(36) = -1.85$, $p = .04$ (1-tailed), $d = .60$, which is a medium effect according to Cohen's conventions (Cohen, 1988).

Discussion

The focus of this study is on gifted students in secondary education, their mindset and the way they are motivated at school.

This study provides evidence for the presumed difference in mindset between gifted and non-gifted students in secondary education. Compared to their peers in regular VWO classes, gifted students in UniqXL education more often hold a fixed mindset. The results of the current study confirm the theory of Dweck (2012) on implicit theories of intelligence and gifted children and therefore the first hypothesis can be adopted. This is an important finding, because it can be one of the reasons why so many students who are labelled gifted do not exploit their potential. According to Dweck (2012) students with a fixed mindset are fragile since they are overly concerned with how intelligent they are. Their goal is to feel and look smart and when learning becomes arduous they become discouraged or defensive. This withholds them from investing effort and persistence in order to master a difficult task.

Although it seems logical here to connect an entity view of intelligence to performance (avoidance) achievement goals this research failed to demonstrate a considerable relation between these constructs in the gifted population. In their model Dweck and Leggett postulate that goal orientations are mediators between implicit theories of intelligence and achievement. In their opinion people with an incremental theory of intelligence pursue mastery goals and people with an entity view of intelligence pursue performance goals (Dweck & Leggett, 1988). The results of this study only partially confirm this theorem. Within the regular VWO sample statistically significant positive relations are found between a growth mindset and both mastery-approach *and* performance-approach goal orientations. This confirms the importance of adding the valence dimension in the two-goal-model. The data shows a relation between a growth mindset and approaching success although driven by different motives (mastery or performance oriented).

Within the gifted sample, no significant relations are found between mindset and goal orientations. Correlations though, reveal negative, non-significant relations between mindset and performance-approach and performance-avoidance goal orientations. This indicates that an entity view of intelligence is related to striving to perform well compared to others, or preventing not to do worse than others. These relations though, are not strong enough to be significant.

Yet it remains unclear why mastery-approach goal orientation does not correlate with a growth mindset within the gifted sample, unlike the VWO sample. This might indicate that the populations actually differ. An explanation for this difference between groups can be found in the stereotype threat. The gifted label might encourage the believe of gifted children that their intelligence is an inborn gift. Spending time and effort on performing academic tasks in order to master them (adopting mastery-approach goals) threatens this believe. Aronson and Juarez (2012) suggest that stereotype believes can be manipulated by simply mixing students into heterogeneous groups. Separating the gifted, like the UniqXL classes, might show a reversed effect: spending time and effort on learning tasks in classes filled with smart students could be viewed by them as a demonstration of low ability. More research is needed to fully clarify the effects of labelling and the stereotype threat on gifted students.

Do implicit theories of intelligence change over the years when students get older and when their time spent in the UniqXL educational setting increases? The answer on this question is complex. Looking at the results, the mean mindset of gifted students in UniqXL education increases significantly from grade one to grade two, but decreases from grade two to grade four. The methodological design of this study is not adequate for drawing causal conclusions, however, the results of this part of the study are hopeful. The increase in mean mindset scores between grade one and grade two indicate a change of mindset in the expected direction from fixed to growth. Considering the UniqXL concept is still in a developmental stage and schools are experimenting with several interventions to meet the educational and psychological needs of the gifted students this study suggests some progress is made.

Since research showed that an incremental theory leads to better performance, mediated by mastery oriented strategies like effort, persistent and deep-level-learning (Dupeyrat & Mariné, 2005), it is important to investigate how these strategies can be taught and how mindsets can be changed through educational interventions. One of the interventions is feedback. According to Renzulli (2012) increasing knowledge about students' implicit theories of intelligence and their impact on motivation and resilience can help teachers provide students with appropriate feedback on their performance. Appropriate feedback has proven to be a powerful intervention in education. Given at the task, process or regulation level it can be very effective (Hattie and Timperley, 2007). To illustrate this, empirical research by Butler shows that different kinds of feedback seem to promote different motivational orientations. Individual comments stimulate mastery goal orientation and praise or grades stimulate performance goal orientation (Butler, 1987). For this reason Dweck (2012) warns us to be careful with praise. Especially intelligence praise ("clever boy/girl!") can be very harmful to vulnerable students. Being praised for abilities makes students feel intelligence is fixed while being praised for effort (process praise) makes them focus on improvement. More research on how to change goal orientations and mindsets of gifted students by means of feedback is recommended.

Four years ago when this educational concept for the gifted was operationalized, schools were facing organisational and financial challenges which had to be handled first. Since these challenges were met schools increasingly pay attention to content and motivational issues and focus on guiding

students. This could be an explanation for not finding the same results for the difference between grade two and three and grade three and four. In short, to draw conclusions from the current study concerning research question three would be premature so the hypothesis is rejected. It is recommended to investigate this issue in a longitudinal study with an repeated measures design in order to observe changes in the mindset of students over the years.

Limitations

This study has some considerable limitations. Despite the large sample size and the demographic spread of the participating schools, findings cannot be generalized. Although support was found for a significant difference in mindset between gifted UniqXL and regular VWO first grade students, some cautions have to be made in interpreting this difference.

First and most important the sample used in this study seemed to be rather blurred; a clear distinction between gifted and non-gifted students cannot be made. In the design of this study, the UniqXL concept was starting point for discriminating the gifted students from regular VWO students. Most students in the UniqXL classes are former Leonardo primary school pupils. Leonardo primary schools are schools for fulltime gifted primary education who work with a similar concept. These students had been diagnosed before entering Leonardo education and most of them attended Leonardo education because of severe cognitive, social or emotional problems in regular education. In regular VWO classes a part of the population is probably gifted as well although seldom diagnosed. The presence of gifted students in the control group blurs the distinction between groups.

In order to be able to generalize findings, the sample is enlarged by contacting all other schools working with the UniqXL concept and asking them to participate. Only three of them were willing to participate. During this research project it became clear that the schools mentioned on the UniqXL website differ in their elaboration on the UniqXL concept substantially. All schools are working on a special gifted program, but there is only one school where the gifted population is separated from the regular VWO students. Organisational and financial difficulties force schools to mix their students and find practical solutions for serving their gifted students. As a consequence a sharp distinction of gifted and regular education cannot be made and educational interventions to serve the gifted (e.g. stressing effort and persistence, giving process feedback) actually affect both groups.

Finally, the gifted population is rather heterogeneous. For example, Betts and Neihart (1988) distinguish five types of gifted children: 1) the successful, 2) the underground, 3) the double labelled, 4) the dropout and 5) the autonomous student. Besides giftedness other child factors like autism spectrum disorders (the double labelled children), perfectionism and underachievement could influence their perception of intelligence. These factors have not been accounted for in this study. More research is needed to investigate the relation between these factors and the mindsets of gifted students.

Also concerning research question two there are some limitations. The weak relations between implicit theories of intelligence and goal orientations can be explained by a lack of statistical power of this research. The sample size of the gifted students is rather small compared to the VWO sample.

Another issue is the presumed one dimensionality of the mindset construct. Dupeyrat and Mariné (2005) argue this. In their opinion implicit theories of intelligence are domain- and context specific. A student can think intelligence is malleable in one domain, but fixed in another. Given the assumption of Sternberg (1985) that intelligence is a multidimensional construct containing analytical, creative and practical knowledge it is possible that gifted students think that some dimensions of their intelligence are fixed and others are malleable. The same holds true for goal orientation. Goal orientations can also differ across domains and contexts (Pintrich, 2000). People can adopt different goal orientations in different situations. It is conceivable that students do not hold an entity or incremental view of intelligence in general or pursue the same goals in all domains.

The results of research question three are unexpected and inconsistent with each other: an increase in mindset scores from grade one to two and a decrease from grade two to three and three to four. The methodological design of this study is not adequate for drawing causal conclusions. The statistical power of this study is not strong enough to support the hypothesis of an increase of growth mindsets due to the limited sample size of grade two and four. Moreover, the results cannot be attributed to the educational approach solely. One of the other influencing factors is the age of the students. During the secondary school period, puberty prospers. Academic achievement and motivation are influenced by a lot of factors accompanying puberty. For example, Subotnik (2012)

points to the fact that in order to be socially successful young scholars do not want to be studious and for that reason avoid showing effort. More research is needed to explain this phenomenon.

Scientific and Practical Implications

The general aim of this study was to investigate the influence of implicit theories of intelligence of gifted students in secondary gifted education on motivation. Giftedness is defined dynamically by most researchers in the field of gifted education. In general, research shows that intelligence is malleable and the human brain can be stretched by working hard and persevere in the face of setbacks (Blackwell, Trzesniewski, & Dweck, 2007; Ericsson et al., 2003; Sternberg, 1999). A logic consequence is that students with a fixed mindset (entity theorists) are at risk. This study shows that gifted students in UniqXL education actually more often than regular VWO students hold an entity view of intelligence. This important finding can be a start to search for ways to change this tendency and improve their motivation. Future research should focus on designing and testing mastery oriented interventions. If successful interventions to influence the implicit theories of intelligence of the gifted are found, many more of them will blossom and show what they are really capable of.

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