Türk Üstün Zekâ ve Eğitim Dergisi
2012, Cilt 2, Sayı 1, 2-17

Turkish Journal of Giftedness and Education
2012, Volume 2, Issue 1, 2-17

Üstün Zekâlı Kişilere İlişkin Kültürler Arası Örtük Teoriler Çalışması

A Cross-Cultural Study of Implicit Theories of an Intelligent Person

Abdullah Aljughaiman[1], Xiaoju Duan[2], Marion Händel[3], Manuel Hopp[4], Heidrun Stoeger[5] & Albert Ziegler[6]

Öz

Bu çalışma, örtük üstün zekâ kuramlarının öznel eylem alanlarını ve dolayısıyla öğrenme davranışını etkilediği varsayımına dayanmaktadır. Bu bağlamda bireyin üstün zekâ hakkındaki örtük kuramları ayrı bir önem taşımaktadır. Bu varsayımla yola çıkılarak kültürler arası yapılan araştırmada, Kenya ve Almanya'dan 200 öğrenciye üstün zekâlı bir kişi çizmeleri ve daha sonra çizdikleri tipleri verilen bazı özelliklere göre derecelemeleri istenmiştir. Veriler, öğrencilerin örtük zekâ kuramları arasında önemli farklılıkların olduğunu ortaya koymuştur. Zeki bir kişiye ilişkin örtük teoriler ile çizimi yapan öğrencilerin cinsiyetleri ve milliyetleri arasında ilişki bulunmuştur. Özellikle Alman kızlar zeki kişi prototipleri olarak daha çok karşı cinsi çizmişlerdir. Elde edilen bulgulara göre, üstün zekâlı kişiye ilişkin örtük teoriler çok yönlü bir resim ortaya koymaktadır. Araştırmada en dikkate değer bulgu, üstün zekalı kişilere ilişkin çizimlerde "çalışkanlık" özelliğinin en anlamlı tek özellik olarak resimlerde yer bulmasıdır. İleriki araştırmalarda örtük teorilerin, üstün zekâlı öğrencilerin öğrenme davranışları üzerindeki etkileri ayrıntılı olarak araştırılmalıdır.

Anahtar Sözcükler: örtük zekâ teorileri, kültürler arası araştırma, eylem alanı üstün zekâ modeli, öznel eylem alanı

Abstract

This contribution is based on the assumption that implicit theories influence the subjective action space and hence the learning behavior of students. The implicit theory that an individual holds of an intelligent person is of particular importance in this context. For this cross-cultural study, we asked 200 students from Kenya and Germany to draw an intelligent person and then to rate the typicality of the drawing with respect to a number of attributes. The data indicated considerable differences among the students' implicit theories of intelligence. Implicit theories of an intelligent person correlated with the nationality and the gender of the students who made the drawings. German girls, in particular, frequently ascribed a gender to their prototypically intelligent person which differed from their own. Our data offer evidence that implicit theories of an intelligent person reflect a multifaceted picture. The most meaningful single attribute identified by participants for the figures they had drawn was that of being hardworking. We conclude that future studies should further examine the influence of implicit theories on the learning behavior of gifted students.

Key Words: implicit theory of intelligence, cross-cultural study, actiotope model of giftedness, subjective action space

[1] *Prof., Director, National Research Center for Giftedness and Creativity, King Faisal University, Saudi Arabia*
[2] *Asst. Prof., Institute of Psychology, Chinese Academy of Sciences, Beijing, China*
[3] *Ph.D., University of Erlangen-Nuremberg, Nürnberg, Germany*
[4] *University of Ulm, Ulm, Germany*
[5] *Prof., Chair, Department of School Education, Regensburg University, Regensburg, Germany*
[6] *Corresponding author, Prof., Chair, Department of Educational Psychology, University of Erlangen-Nuremberg, Nürnberg, Germany; Albert.Ziegler@ewf.uni-erlangen.del*

ISSN 2146-3832, http://www.tuzed.org

Theoretical Background

In accordance with the actiotope model of giftedness, we view individual learning and skill development as the results of an individual's dynamic interaction with a personal environment. During this interaction process individuals only use a subset of the innumerable action options for which their personal environments allow. Three components of an individual's actiotope determine this relationship (Ziegler, 2005; Ziegler, Vialle, & Wimmer, in press).

The Generation of Actions in an Individual's Subjective Action Space

The term *action repertoire* describes all the actions which a person can, in theory, carry out. A person's action repertoire normally expands over the course of development. In this sense, educational efforts are concerted efforts on the part of educators to help an individual develop an effective action repertoire. A seventh grader, for instance, can execute more mathematical operations than a third grader. The action repertoire places limits on the parts of the environment with which an individual can interact.

An individual's *goals* represent another important actiotope component. Goals describe desired states as they pertain either to an individual's physical entity (e.g., assuming a certain posture, seeking warmth, finding nourishment) or the surrounding world (e.g., opening a door, putting glasses on, writing a word). In other words, individuals interact with their environments in a goal-directed manner.

The third component of an individual's actiotope is *subjective action space*. We understand the subjective action space as a sort of mental navigation space of behavior possibilities. It is the framework within which an individual generates and accepts possible actions. Generating actions within the subjective action space involves coordinating an individual's action repertoire, goals, and environment. An individual's action space is subjective in that it represents a construct which need not reflect reality. This explains why a person can, for instance, over- or underestimate the breadth of her or his repertoire of actions or choose dysfunctional actions in a particular situation. As implicit theories play a crucial role in the development of one's subjective action space, we examine them more closely in this contribution.

Implicit Theories and Subjective Action Space

One important function of implicit theories is helping individuals to orient themselves within their subjective action space. More specifically, they offer individuals insight into whether their action repertoire is sufficient for pursuing certain goals under given circumstances within their respective environments (Ziegler, 2012).

The situation of gifted girls and women in the area of STEM (an acronym for science, technology, engineering, and mathematics) is a frequently cited example of how implicit theories can influence individuals' subjective action space. Such girls and women possess action repertoires which are just as effective as those of boys and men. The girls and women fail, how-

ever, to integrate all of these skills into their subjective action spaces (Stoeger, 2007; Zorman & David, 2000). In the case of mathematics, girls underestimate the effectiveness of their action repertoire. Among other things, they believe that they need to work harder than their male peers in order to achieve an equal amount of success. This view appears to reflect the acceptance of gender-role stereotypes, which begin to have negative effects for girls around the age of ten. It is around this age that girls start showing evidence of less efficacious control beliefs and higher rates/amounts/levels of helpless than male students. In fact it is gifted girls and women in particular who then avoid STEM fields and subjects and thus become underrepresented in those fields (Händel & Ziegler, 2012).

Yet the example of girls whose dysfunctional implicit theories have a dramatically negative influence on their subjective action space is most certainly not an exceptional case. Quite to the contrary, numerous studies show that a good number of self-related implicit theories contain dysfunctional beliefs regarding an individual's own potential actions. Researchers estimate that the magnitude of the impact of dysfunctional beliefs on learning accomplishments and on performance on IQ and creativity tests may be as much as one standard deviation (for an overview, cf. Stoeger, 2009).

However, implicit theories can also indicate that creating action alternatives is worth the effort. The experiment conducted by Shih, Pittinsky, & Ambady (1999) offers a good case in point. While people in the United States tend to ascribe above-average mathematics abilities to Asian students, people, normally, view women as possessing below-average mathematics abilities. Women of Asian descent in the United States are an interesting case in that they instantiate both attributes: They are "Asian" and they are "women." When, in experiments, participants representing this group were reminded of their ethnicity, their mathematics performance improved. When they were reminded of their gender, their mathematics performance worsened. The activation of a certain implicit theory clearly compelled test persons to use more or less effective operations and actions.

Implicit Theories of Intelligence

In the area of learning, implicit theories about learners' intelligence and giftedness have a considerable influence on individuals' subjective action space. The considerable amount of scholarly interest focused on implicit learning theories over the past decades thus seems well justified (Dweck, 1999; Sternberg, Conway, Bernstein, & Ketron, 1981). In various studies (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Mueller & Dweck, 1998), researchers have shown, for instance, that implicit theories influence learning behavior, the approaches individuals take to learning and performance situations, the learning goals individuals set as well as (mediated throug the factors of effort and persistence) their accomplishments, intelligence, and creativity.

Researchers have also examined implicit theories in the case of gifted individuals. For example, Alexander (1985) conducted a study with gifted and non-gifted students of their percep-

tions of intelligence. The author scored students' answers in questionnaires and extracted the most frequently occurring concepts such as being smart, knowledge as well as academic and social skills. While non-gifted students focused more on social and academic skills, their gifted peers focused on cognitive processes. A study conducted by Yussen and Kane (1983) indicates that younger children perceive social aspects as being important for intelligence; whereas older students focus on academic skills.

Studies documented substantial gender effects. In a study by Raty and Snellman (1997), for example, individuals asked to draw an *intelligent* person where more likely to draw images of male adults than were individuals asked to draw an *ordinary* person. Mottus et al. (2008) found that academically highly able women were assessed significantly higher with regard to gregariousness, activity, aesthetics, and order compared with typical academically highly able men. In another study, Paulhus and Landolt (2000) asked students to rate a list of intelligent persons (e.g., Einstein). Along with other factors, sex-match was shown to be associated with high nomination rates. In addition, the stable paragons appear to cluster in terms of subtypes of intelligence: science/engineering, verbal/creative, social/political, and business. These subtypes can be seen as comparable to the prototypes proposed by Sternberg et al. (1981), namely problem solving, verbal fluency, and social intelligence.

In their study with German pupils, Rammstedt and Rammsayer (2000, 2002) also identified substantial gender effects. The researchers asked study participants to assess their own intelligence and that of their parents. Male study participants rated their logical, mathematical, and spatial abilities higher. Female participants rated their musical and interpersonal abilities higher. Participants' assessments of their parents' abilities adhered to the following pattern: To their fathers they ascribed higher levels for general intelligence, reasoning, and mathematical and spatial abilities; with respect to their mothers, on the other hand, they saw better verbal, musical, and inter-personal abilities.

Besides convincing evidence of a robust gender effect, there is also ample evidence that culture plays a major role in the formation of implicit theories of intelligence. Indeed, researchers such as Furnham (2000) and Rammstedt and Rammsayer (2000) suggest that the definition of intelligence is shaped by cultural factors. This view is also shared by researchers studying implicit theories of intelligence (e.g., Dweck & Leggett, 1988). In their frequently cited paper, Lim et al. (2002) compared studies from the Western world which used Western study participants to studies with African or Asian samples. African and Asian study participants seem to emphasize social aspects of intelligence (e.g., by combining attribute adjectives such as "cooperative" with the term intelligence) and aspects that facilitate interpersonal and group relations. In contrast, the Western concept of intelligence seemed to be more dominated by references to the classical academic subjects such as mathematics.

Current Research

In the opening section we advanced our claim that implicit theories of intelligence can have a considerable influence on the possible actions which an individual generates within her or his subjective action space. It is therefore important to understand these implicit theories. In our study we are specifically interested in adolescents' prototypical perceptions of intelligent persons. We started by making the assumption that adolescents have differentiated perceptions of the characteristics which intelligent persons possess. In order to test our assumption we asked our study participants to draw an intelligent person. We then asked them a number of questions about the person they had drawn. We asked them, for instance, about the depicted person's age, popularity, and artistic abilities. The attributes we asked about were those for which researchers have identified typical differences (as we described above).

As researchers have repeatedly identified gender differences, we placed special emphasis on the observation of gender differences. In accordance with the typical "male-normativeness of IQ" (Furnham, 2001), we expected that the prototype of an intelligent person would have male features.

There is also reason, however, to expect that the gender of the pupil who is making the drawing may play a role in determining the nature of the prototype (cf., Furnham, 2001). For this study we considered this effect as a congruence effect. We expected to identify gender as a main effect which, however, we predicted would be moderated by study participants' own gender.

We also examined a congruence effect with respect to age. Do pupils tend to draw an intelligent person who is of their own age? Extant research suggests that the prototypically intelligent person that a student draws will be older than the person doing the drawing and, furthermore, that boys tend to draw prototypes with a greater age difference than girls do (Raty & Snellman, 1997).

We also examined the culture dimension as described by Lim et al. (2002) and Rammstedt and Rammsayer (2000). We selected two cultures which we assume are quite different from one another. Although cross-cultural studies on implicit theories of intelligence with German and Kenyan subjects do not exist, there are several reasons to assume that such a study will find considerable differences. Firstly, the educational systems of both countries are quite different from one another. In our study, participants were seventh graders. Primary education in Germany covers the first four years of mandatory schooling. Secondary education starts in fifth grade, when pupils are separated into different tracks (according to their achievements and teacher recommendations) and lasts five to eight years depending on the type of secondary schooling a pupil receives. In Kenya primary education lasts eight years; four years of secondary education then follow. Secondly, the concept of intelligence differs in both cultures (cf. Langfeldt, 2011; Wober, 1972, 1974). German society stresses academic aspects of intelligence. African cultures' conceptions of intelligence revolve largely around skills that

help facilitate and maintain harmonious and stable intergroup relations (Grigorenko et al., 2001; Ruzgis & Grigorenko, 1994; Sternberg, 2007). Grigorenko and her colleagues (Grigorenko et al., 2001) for example found four distinct terms constituting conceptions of intelligence among rural Kenyans, corresponding to knowledge and skill, respect, comprehension of how to handle real-life problems, and initiative. Thirdly, both cultures differ in regard to many variables that might have an influence on the concept of a prototypically intelligent person. For example, average life expectancy in Kenya and Germany differs dramatically, standing at around 80 years in Germany and 55 years in Kenya. This might influence the assumed age of a prototypically intelligent person.

Although in most studies only main effects of culture and gender could be found, we also investigated possible interactions of these variables. Two more aspects distinguish our study. First, ours is the first study of this type to examine German and Kenyan culture. Second, we assessed several attributes of a prototypically intelligent person which earlier cross-cultural studies had not addressed such as, for instance, technical skills.

Method

All reported data are individual data that we collected via paper-and-pencil questionnaires. The data reported in this paper focus on children's prototypical views of intelligent persons and are part of a larger study in which children's prototypical views of intelligent and creative persons were collected. Students were randomly assigned to answer first the questionnaire about intelligence or creativity, respectively. We will not, however, consider the perceptions of creativity in this paper.

Sample

Data for about 400 grade-seven students from two countries (193 from Kenya and 207 from Germany) are reported. Due to the different schooling systems in the two countries, Kenyan seventh graders are classified as primary school students (primary schooling in Kenya encompassing eight grades) and German seventh graders are classified as secondary school students (primary school in Germany encompassing four to six years). The mean age of the students was 13.5 years (SD = 1.1). 48.4% of the students were female. Table 1 illustrates the characteristics of the sample separately for Kenya and Germany.

Table 1. Sample of the Study

Country	N	Age (years), M (SD)	Female (%)
Kenya	193	13.9 (1.1)	52.8
Germany	207	13.1 (1.0)	44.9

Measurements

We provided study participants with oral instructions and written items in the questionnaire in their native language. We collected data on students' nationality, grade, age, and gender.

To assess prototypical views of intelligent persons the following procedure was realized. Students were asked to draw a picture of an intelligent person. They were given five minutes for the task. Hence, the underlying aim was not to preserve detailed pictures for analysis afterwards (cf. Raty & Snellman, 1997). We instead asked students to describe their picture in more detail according to several criteria presented to them on the questionnaire. This procedure has the advantage of allowing for objective scoring rather than requiring interpretation of the actual drawn images.

The presented criteria were: gender (*male/female*) and age (in years) of the drawn person. In addition, students were asked to answer eight items on a six-point rating scale of correctness (1: *not at all true*; 6: *very true*) with respect to their drawing. In particular, talent in several domains (mathematics, artistic, languages, and technical skills), social aspects (popularity, sociality) as well as willingness to work hard and imagination of the drawn intelligent person had to be rated by the students. The items were:

The intelligent person in my picture …

- … is mathematically talented.
- … is well liked by others.
- … is talented in artistic areas.
- … likes to be around other people.
- … is talented in languages.
- … is imaginative.
- … has good technical skills.
- … is hardworking.

Results

We will first describe students' prototypical image of an intelligent person. Afterwards we go into more detail regarding gender and culture differences and their interaction.

37.3 % of the students drew a female person. The majority of students (62.7%) drew a male person. A chi-squared test indicates that this difference is significant ($X^2 = 26.01$, $p < .001$). The mean age of the drawn intelligent person was 24.5 years ($SD = 13.6$). In other words, students on average estimated the intelligent person as being 11.0 years their senior ($SD = 13.7$). Only 20.0% of the students drew an intelligent person who was younger than themselves.

The relevance of several attributes of an intelligent person is displayed in Table 2 and ordered by importance. Students envision an intelligent person as being hardworking, imagi-

native, and talented in the domains of mathematics and reading. Less considerable characteristics were sociability, popularity, and talent in technical and artistic domains.

Table 2. Characteristics of an Intelligent Person, Ordered by Importance (scale: 1–6)

	M	SD
Hardworking	5.27	1.04
Mathematically talented	4.90	1.29
Talented in languages	4.80	1.32
Imaginative	4.71	1.35
Social	4.30	1.51
Popular	4.29	1.40
Good technical skills	4.26	1.63
Talented in artistic areas	3.86	1.62

As the perceived gender of an intelligent person is more frequently male, we investigated whether this result was influenced by the gender of the study participants, i.e., those making the drawings. Table 3 shows that the perceived gender of an intelligent person more frequently corresponds to the gender of the person who made the drawing. A Mann-Whitney-U-Test with gender as the independent variable and the gender of the drawn person as the dependent variable showed that the attributed gender of the drawn intelligent person does depend on the drawer's gender (U = 10715, z = -9.58, p < .001). Table 3 illustrates that boys mostly draw males (85.3%) and girls mostly draw females (61.0%).

Gender differences were also found when analyzing the two countries separately (Kenya: U = 2232, z = -7.20, p < .001; Germany: U = 3226, z = -6.16, p < .001). However, a comparison of the total number of drawings of male versus female intelligent persons shows a difference between the two countries (U = 16554, z = -3.54, p < .001). A majority (71%) of the German study participants envisioned an intelligent person who was male. Only about half (53.9%) of the Kenyan study participants envisioned an intelligent person who was male.

Table 3. Envisioned Gender of an Intelligent Person, Separated According to the Study Participants' Gender and Country

	Total		Kenya		Germany	
	Male	Female	Male	Female	Male	Female
Boy	85.3	14.6	81.3	18.7	88.6	11.4
Girl	39.0	61.0	29.4	70.6	49.5	50.5
Total	62.7	37.3	53.9	46.1	71.0	29.0

To investigate cultural differences in the perceived age of the drawn intelligent person we conducted a univariate analysis of covariance (ANCOVA) with personal age as covariate (as the age difference between Kenyan and German students is significant, $t(398) = 7.248$, p < .001). On average, the Kenyan students perceived the intelligent person as being 23.4 years old (SD = 12.4); the average age ascribed to the images by German students was 25.5 years (SD = 14.6). The difference is not significant ($F(1,397) = 2.092$, p = .148, η^2 = .005).

The analysis of attributes of an intelligent person such as talents in several domains or sociability might be influenced by the order in which pupils answered the questionnaire about intelligence and creativity (see above). We investigated this by running several independent t-tests with questionnaire order as the independent variable. Due to significant differences in the variables mathematically gifted ($t(398) = 2.055$, $p < .05$), hardworking ($t(398) = 1.924$, $p = .055$), liked ($t(398) = -2.285$, $p < .05$) and social ($t(398) = -3.056$, $p < .01$) the ordering of the / order on the questionnaire is entered as a/the covariate in the following analyses.

Multivariate analyses of variance with country, gender, and perceived gender as independent variables and age of the students and order of questions on the questionnaire as covariates were conducted to investigate cultural and gender differences in the perceived characteristics of an intelligent person. Pillai's trace is reported as the value for multivariate effects (see Table 4).

Table 4. Multivariate Results of the Factors Gender, Perceived Gender, Nationality, and Their Two- and Three-Way Interaction Terms

Factors and interaction terms	Pillai's trace	F (8,383)	p	Partial η^2
Gender	.010	0.488	.865	.010
Perceived gender	.013	0.652	.734	.013
Nationality	.169	9.739	**.000**	.169
Gender by perceived gender	.037	1.855	**.066**	.037
Gender by nationality	.025	1.237	.276	.025
Perceived gender by nationality	.037	1.819	**.072**	.037
Gender by perceived gender by nationality	.029	1.429	.183	.029

We detected a significant multivariate effect for nationality and observed moderately significant effects for the interaction of gender and perceived gender and for the interaction of gender and nationality. Table 5 lists the significant univariate effect and Figure 1 displays the pattern of attributes which test participants ascribed to their depictions of intelligent persons. Participants from both nations rated the attributes imaginative and hardworking as well as the talent in several domains equally. Kenyan students attributed higher levels of popularity and sociability to intelligent persons than German study participants did.

Table 5. Univariate Results

Factors and interaction terms	F(1,390)	p	Partial η^2
Nationality			
Liked	60.307	.000	.134
Social	36.193	.000	.085
Gender by perceived gender			
Imaginative	3.373	.067	.009
Hardworking	2.957	.086	.008
Gender by nationality			
Imaginative	3.019	.083	.008
Perceived gender by nationality			
talented in math	2.781	.096	.007
good technical skills	3.953	.047	.010
talented in art	5.539	.019	.014
Social	4.617	.032	.012
Gender by perceived gender by nationality			
Imaginative	4.302	.039	.011

Note. Displayed are only the significant main and interaction effects

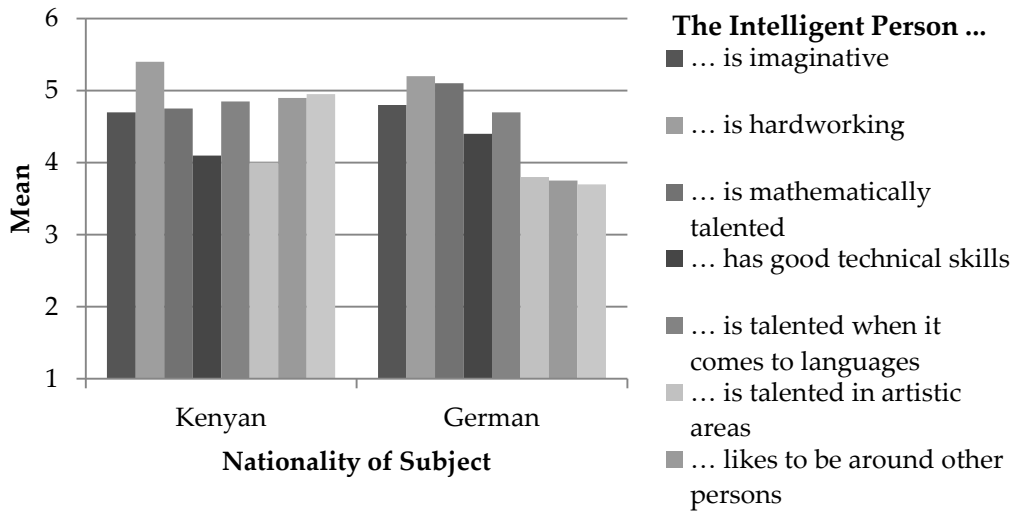

Figure 1. Prototypical Attributes Ascribed to an Intelligent Person, Separated by Culture.

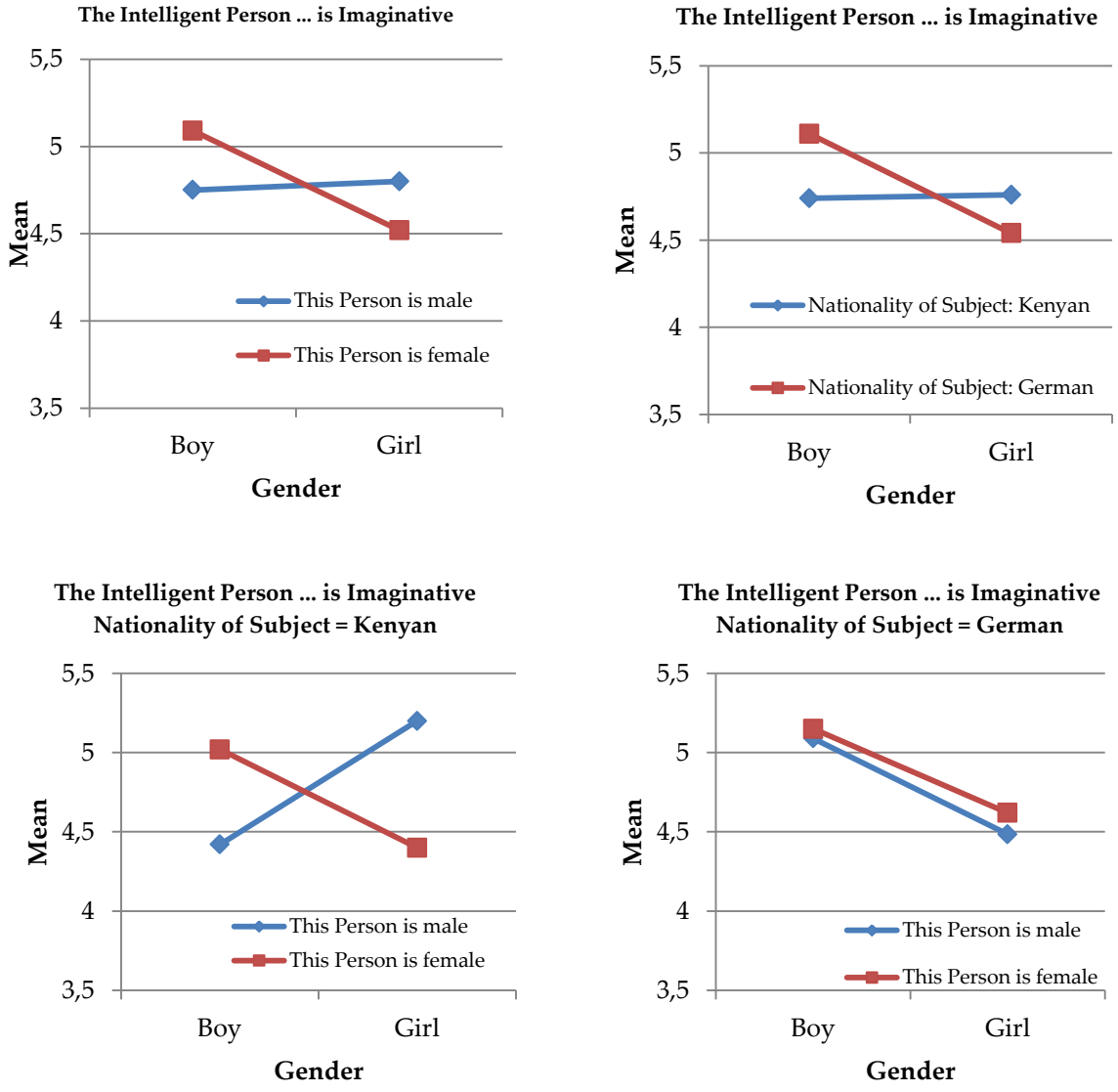

Figure 2. Interaction Effects for the Attribute *Imaginative*

We detected three interaction effects for the attribute *imaginative*: gender by perceived gender, gender by nationality, and gender by perceived gender by nationality (cf. Figure 2). Both boys and girls who drew an intelligent person with the opposite gender attributed more imagination to intelligent persons than boys and girls who drew an intelligent person of their own gender respectively. Kenyan boys and girls ascribed an equal amount of imaginativeness to the intelligent persons they drew. In contrast, German boys perceived the intelligent persons they drew as more imaginative than did German girls. Finally, we observed interaction effects of gender and perceived gender for Kenyan students, but not for German students.

We found a marginally significant interaction between gender and perceived gender for the attribute *hardworking* as subjects applied it to the intelligent persons they had drawn (cf. Figure 3). When we asked boys to quantify just how hardworking the intelligent person they had drawn was, the responses of boys who drew a male figure were similar to those of boys who drew a female figure. This did not hold for the female test subject, however. Girls who drew an intelligent male deemed their figures more hardworking than girls did who were judging drawings of female intelligent persons.

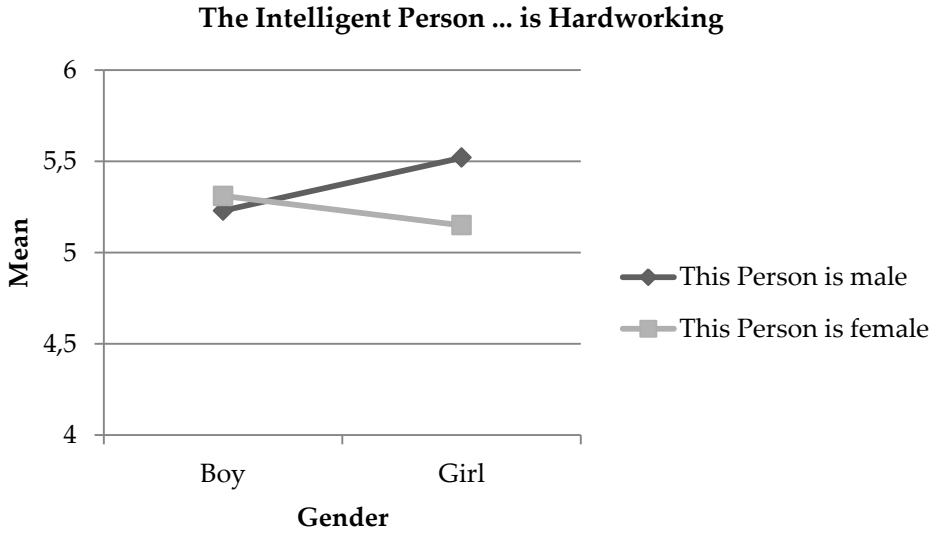

Figure 3. Interaction Effect of Gender and Perceived Gender for the Attribute Hardworking

The interaction effects of perceived gender and nationality are shown in Figure 4. The result patterns for *talent in mathematics* and *skill in technical domains* are similar. German students who drew an intelligent male attributed more talent in mathematical and technical domains to their figures than did German students who drew an intelligent female. In contrast, German students who drew an intelligent male attributed less talent in artistic domains and less sociability to their figures than did German students who drew an intelligent female. German students thus attributed greater levels of gender-specific stereotype characteristics to their drawings than Kenyan students did.

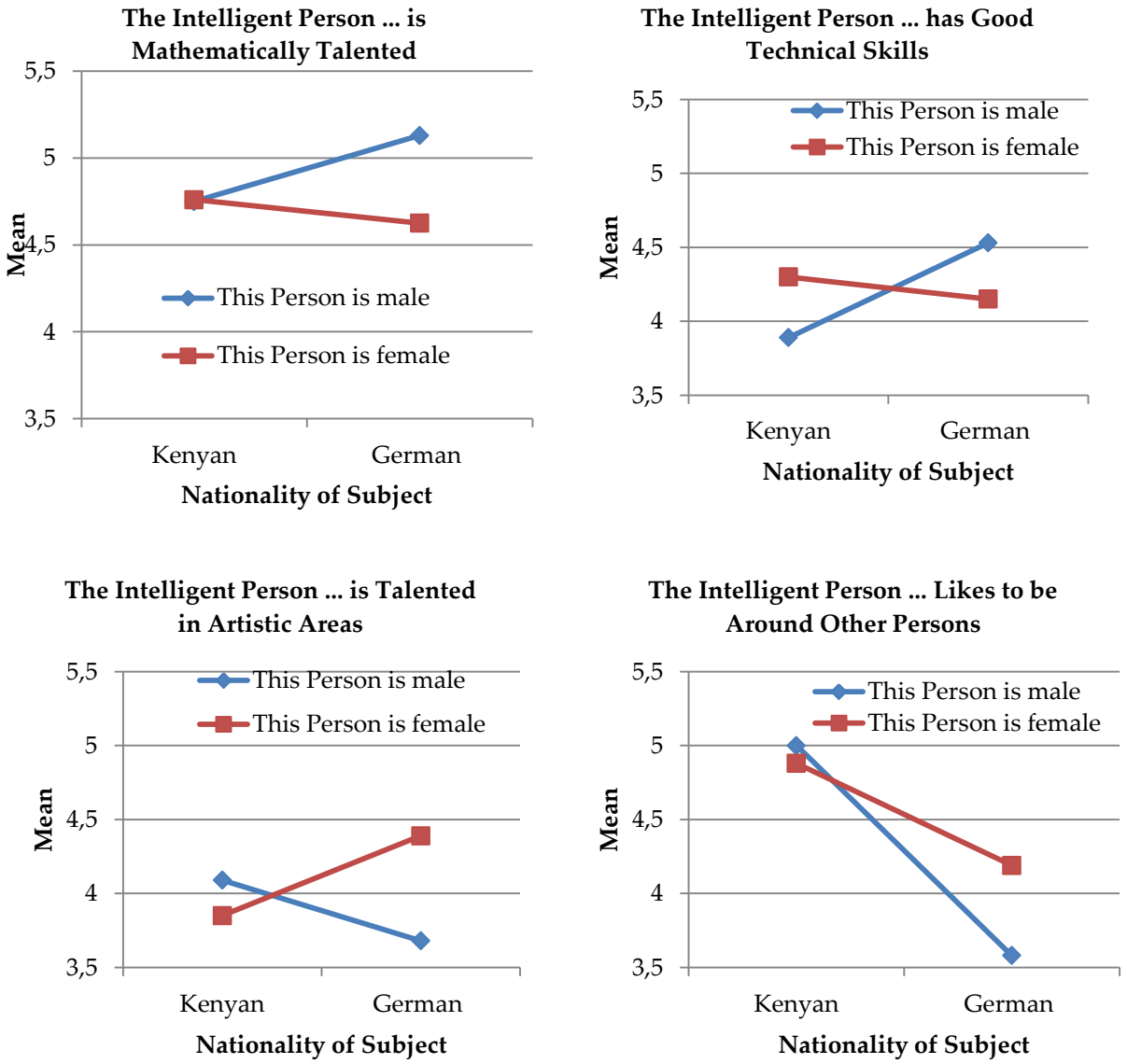

Figure 4. Interaction Effects of Nationality and Perceived Gender for Talent in the Domains of Mathematics, Technical Skills, and Art as Well as Sociality

Discussion

According to the actiotope model of giftedness, developing expertise means gradually expanding one's action repertoire (Ziegler, 2005). This process takes years and ends up reflecting a dizzyingly high number of individual learning episodes (Ziegler, Vialle, & Wimmer, in press). Each of these individual learning episodes demands an augmentation of the number of actions within an individual's subjective action space. Implicit theories play a crucial role in this process, because they can, among other things, carry information which can facilitate expansions of an individual's action repertoire. Among implicit theories, implicit theories of

intelligence are particularly important, as they can determine whether gifted students consider themselves capable of achieving particular learning goals.

We have a number of important findings to report. First, a student's prototype of an intelligent person is oftentimes not identical with her or his own characteristics. A number of observations support this conclusion. The pupils' prototypes of an intelligent person depicted individuals who were supposed to be an average of 11 years older than the study participants. In other words, students from both countries perceive intelligent persons as being in their mid-twenties. Although life expectancy is much higher in Germany than in Kenya, students do not significantly differ in the age they ascribe to an intelligent person: In Kenya, people in their mid-twenties are usually married, have children, and are settled. A considerable portion of Germans in their mid-twenties may have spent the first half of that decade working through programs of tertiary education (earning a master's degree, for instance).

Second, the gender of the prototype was often not that of the study participant who had made the drawing and answered our questions. Overall, more prototypes of an intelligent person were male. This effect is mainly due to German students, especially German girls. German girls' attributions differed from those of Kenyan boys and girls and German boys in that they were the most likely to not draw an intelligent person of their own gender. Instead, the female German study participants' drawings were split roughly evenly between male and female depictions. That is, half of the German girls who participated in the study spontaneously drew an intelligent male. As a consequence, it is conceivable that those girls who drew male figures may conclude that they, by reason of their gender, are not as intelligent as their male peers.

In addition to asking study participants about the age and gender of the person they had drawn, we also had them assess their figure according to eight attributes of an intelligent person. We found cultural differences for two of these attributes. Kenyan students place an equal emphasis on social variables and other variables (e.g., the attributes hardworking as well as mathematically talented). This concurs with other studies that found that the concept of intelligence is primarily expressed in rural Kenyan vocabulary by four concepts, which appear to form two latent structures, social-emotional competence and cognitive competence (Grigorenko et al., 2001). German students in contrast do not emphasize social variables as characteristics of intelligence but instead highlight talent and other attributes. That is, German students' answers adhere more closely to established Western intelligence stereotypes by emphasizing cognitive variables and talent and downplaying the role of social variables.

A particularly interesting finding is the significant interaction of perceived gender and nationality. These results indicate that gender is heavily influenced by cultural factors. For example, German students who drew intelligent males attributed higher levels of *mathematical talent* and *technical skills* to their figures. In contrast, German students who drew an intelligent female attributed higher levels of talent in artistic domains and also greater popularity

to their figures. Regardless of their own gender, German students differed from their Kenyan peers in their perceptions of intelligent males and females regarding the stereotypically male domains of mathematics and technological skills and the stereotypically female domains of art and being liked. Kenyan students' patterns of assessing their figures' attributes did not differentiate as much between male and female intelligent persons. With regard to *technical skills*, Kenyan participants showed an unexpected pattern: Students who had drawn an intelligent female attributed higher levels of technical skills to their figures than did students who had drawn an intelligent male.

In conclusion we want to stress three findings which are important for gifted education. First, students have differing implicit theories of intelligence. As earlier studies have clarified (Ziegler, 2012), implicit theories of intelligence influence learning outcomes. Thus, educators need to keep their pupils' implicit theories of intelligence in mind and need to be aware of just how different these can be from pupil to pupil. When an educational effort fails to yield a desired result, teachers need to consider the possibility that disadvantageous implicit theories of intelligence may be at work.

Second, the prototype that an individual creates of an intelligent person correlates with the culture and the gender of the person who is creating the prototype. It should be pointed out, however, that while we know that these correlations exist, a more precise description of their nature remains elusive. What was unambiguous in our results was the greater frequency with which German girls created counter-gender images by envisioning an intelligent male: German girls were just as likely to draw a male figure as they were to draw a female figure. For Kenyan participants of both genders and for the German boys, on the other hand, we observed a clear congruence effect: boys tended to depict males, and girls tended to depict females.

Third, our data offer insights into other attributes commonly ascribed to an intelligent person prototype. The attribute deemed most important by both the German and Kenyan study participants was not an ability found within a classic talent domain but rather an individual's willingness to work hard. The attribute *hardworking* ranked first among students' attributions. This view fits well into the malleable theory of intelligence as described by Dweck (1999). Participants' assessments indicate that they ascribe less importance to the attributes of *talented* (in mathematics and in reading) and *imaginative*. Also of lesser importance for the participants are the characteristics of *sociability* and *popularity* as well as of *talent in technical and artistic domains*. With regard to their relative importance, however, Kenyan students ascribed more importance to *sociability* and *popularity* than German students did. This last finding confirms existing research (cf. Grigorenko et al., 2001; Lim et al., 2002).

These findings justify a more focused investigation of the relationships between individual theories of intelligence and learning behavior among gifted students. We envision a cross-cultural study with a longitudinal design that can offer insight into the direction of causality

among findings. The longitudinal design will allow researchers to account for the likelihood that individuals' learning experiences have an effect on their implicit theories of intelligence. The results of our current study suggest furthermore that future work should focus on girls as well as on social and cultural influences.

References

Alexander, P.A. (1985). Gifted and non-gifted students' perceptions of intelligence. *Gifted Child Quarterly, 29(3)*, 137- 142.

Blackwell, L., Trzesniewski, K., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and intervention. *Child Development, 78*, 246–263.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development.* Philadelphia: Psychology Press.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256-273.

Furnham, A. (2000). Thinking about intelligence. *The Psychologist, 13(*10*)*, 510-514.

Furnham, A. (2001). Self-estimates of intelligence: culture and gender differences in self and other estimates of both general (g) and multiple intelligences. *Personality and Individual Differences, 31*, 1381-1405.

Grigorenko, E. L., Geissler, P. W., Prince, R., Okatcha, F., Nokes, C., Kenny, D. A., Bundy, D. A., & Sternberg, R. J. (2001). The organization of Luo conceptions of intelligence: A study of implicit theories in a Kenyan village. *International Journal of Behavioral Development, 25*, 367-378. doi:10.1080/01650250042000348

Händel, M., & Ziegler, A. (2012). Integrated STEM for regular and gifted students in Germany. In K. Tae-wan & L. Gwang-hyeong (Eds.), *Promoting the gifted to be real-world problem-solvers through interdisciplinary education* (pp. 99-112). Daejeong, South Korea: Kaist.

Langfeldt, H.-P. (2011). Conceptions of giftedness among the Oromo People in Ethiopia: The relevance of education. In A. Ziegler & C. Perleth (Eds.), *Excellence* (pp. 94-101). Muenster, Germany: LIT.

Lim, W., Plucker, J., & Im, K. (2002). We are more alike than we think we are: Implicit theories of intelligence with a Korean sample. *Intelligence, 20*, 185–208.

Mottus, R., Allik, J., Konstabel, K., Kangro, E.-M., & Pullmann, H. (2008). Beliefs about the relationships between personality and intelligence. *Personality and Individual Differences, 45*, 457–462.

Mueller, C.M., & Dweck, C.S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal for Personality and Social Psychology, 75*(1), 33-52.

Paulhus, D. L., & Landolt, M. A. (2000). Paragons of intelligence: Who gets nominated and why. *Canadian Journal of Behavioural Science, 32*, 168-177.

Rammstedt, B., & Rammsayer, T.H. (2000). Sex differences in self-estimates of different aspects of intelligence. *Personality and Individual Differences, 29*(5), 869-880.

Rammstedt, B. & Rammsayer, T. (2002). Self-estimated intelligence: Gender differences, relationship to psychometric intelligence and moderating effects of level of education. *European Psychologist, 7*, 275-284.

Raty, H., & Snellman, L. (1997). Children's images of an intelligent person. *Journal of Social Behavior and Personality, 12*, 773-784.

Ruzgis, P. M., & Grigorenko, E. L. (1994). Cultural meaning systems, intelligence and personality. In R. J. Stemberg & P. Ruzgis (Eds.), *Personality and intelligence* (pp. 248-270). New York: Cambridge University Press.

Shih, M., Pittinsky, T. L., & Ambady, N. (1999). Stereotype susceptibility:Identity salience and shifts in quantitative performance. *Psychological Science, 10*, 80-83.

Sternberg, R. J. (2007). Cultural concepts of giftedess. *Roeper Review, 29*, 160-165.

Sternberg, R.J., Conway, B., Bernstein, M., & Ketron, J.C. (1981). Peoples Conceptualisations of Intelligence. *Journal of Personality and Social Psychology, 41*, 37-55.

Stoeger, H. (2007). Förderung von Selbstvertrauen, selbst wahrgenommener Eignung für verschiedene Studienfächer, Interessen und Wahlverhalten durch Rollenmodelle [Using role models to increase one's self-confidence, self-assuredness regarding aptitude for various university majors, interests, and choice behavior]. In P. Ludwig & H. Ludwig (Hrsg.), *Erwartungen in himmelblau und rosarot – Auslöser lebenslanger Geschlechterdifferenzen im Lernen?* (S. 157-175). Weinheim: Juventa.

Stoeger, H. (2009). The One-Sigma Problem: The impact of beliefs on intelligence, achievement and creativity. In Shi, J. (Eds.), *Cultivation and Education of Creativity and Innovation* (pp. 85-96). Beijing, China: CIECI.

Wober, M. (1972). Culture and the concept of intelligence. *Journal of Cross-cultural Psychology, 3*, 327-328.

Wober, M. (1974). Towards and understanding of the Kiganda concept of intelligence. In J.W. Berry, & P.R. Dasen (Eds.), *Culture and Cognition: Reading in Cross-cultural psychology*. London: Methuen.

Yussen, S.R., & Kane, P.T. (1983). Children's ideas about intellectual ability. In R.L. Leahy (Eds.), *The child's construction of social inequality* (pp. 109-133). New York: Academic Press.

Ziegler, A. (2005). The actiotope model of giftedness. In R. Sternberg & J. Davidson (Eds.), *Conceptions of giftedness* (pp. 411-434). Cambridge, UK: Cambridge University Press.

Ziegler, A. (2012). The impact of beliefs on intelligence, achievement and creativity: Theoretical considerations based on the Actiotope Model of Giftedness. In A. Ziegler, C. Fischer, H. Stoeger, & M. Reutlinger (Eds.), *Gifted education as a lifelong challenge*. *Essays in honour of Franz J. Mönks*. Münster, Germany: LIT.

Ziegler, A., Vialle, W. & Wimmer, B. (in press). The Actiotope Model of Giftedness: A short introduction to some central theoretical assumptions. In S. Phillipson, H. Stoeger, & A. Ziegler (Eds.), *Development of excellence in East-Asia: Explorations in the Actiotope model of giftedness*. London: Routledge.

Zorman, R., & David, H. (2000). *Female achievement and challenges towards the third millenium*. Jerusalem, Israel: Henrietta Szold Institute Press.