2015

Learning resources within the Actiotope: A validation study of the QELC (Questionnaire of Educational and Learning Capital)

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Publication Details

Vladut, A., Vialle, W. & Ziegler, A. (2015). Learning resources within the Actiotope: A validation study of the QELC (Questionnaire of Educational and Learning Capital). Psychological Test and Assessment Modeling, 57 (1), 40-56.

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Keywords
educational, capital, qelc, study, questionnaire, validation, resources, actiotope, within, learning

Disciplines
Education | Social and Behavioral Sciences

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Psychological Test and Assessment Modeling, Volume 57, 2015 (1), 40-56

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Anamaria Vladut[1], *Wilma Vialle*[2] & *Albert Ziegler*[3]

Abstract

In the Actiotope Model of Giftedness the important role of exogenous and endogenous learning resources (educational and learning capital) for successful learning is emphasized. However, so far no empirical evidence has been offered to establish a link between an actiotope and learning resources. An economical quantitative measuring instrument is the Questionnaire of Educational and Learning Capital (QELC). In an empirical study with a sample of 248 post-secondary school students from Germany, the empirical link between actiotope variables and learning resources was established. The results showed that the QELC has satisfactory psychometric qualities as well as acceptable factorial and concurrent validity.

Keywords: giftedness, educational capital, learning capital, QELC, actiotope

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Introduction

By definition, gifted persons are individuals who are able to attain excellence in at least one domain (Ziegler & Phillipson, 2012). However, conceptions of giftedness differ markedly in their explanation of precisely what enables these individuals to attain such extraordinary achievement levels. Over the last decade or so, there has been a marked trend toward the incorporation of environmental variables in giftedness models (see also Stoeger & Gruber, 2014). For example, Mönks and Mason (2000) supplemented the three clusters of traits (above average ability, task commitment, and creativity) of the well-known 'three-ring model' (Renzulli, 1986, 2005) with three clusters of people: parents, teachers and peers. In a similar vein, multifactorial conceptions of giftedness such as the Munich Model of Giftedness (Heller, Perleth, & Lim, 2005) or Gagné's DMGT model (Gagné, 2009, 2013) explicitly included external moderators (people, educational institutions, etc.) that, in tandem with internal moderators, transform innate dispositions into high achievements. Indeed, based on his interviews with eminent individuals such as Nobel laureates, Csikszentmihalyi (1996) rightly pointed out that excellence can no longer be localized in the individual alone, but rather in the system consisting of the individual and its environment. Thus, exceptional learning outcomes can be achieved only by individuals who make exceptional use of their exceptionally stimulating environment.

Person-environment systems have recently been referred to as actiotopes (Ziegler, 2005). In the Actiotope Model of Giftedness, it is claimed that a resource-rich environment is necessary for the development of extraordinary achievements (Ziegler & Baker, 2013). In this paper, we want to investigate the substance of this claim for the first time in an empirical study. The underlying assumption is that the stage of development of students' actiotopes is correlated with their possession of learning resources. In the following two sections, we briefly introduce the Actiotope Model of Giftedness and the Educational and Learning Capital Approach, the latter specifying the learning resources in an actiotope.

An overview of the Actiotope Model of Giftedness

Ziegler, Vialle, and Wimmer (2013) offered a straightforward definition of an actiotope: "An actiotope includes an individual and the material, social and informational environment with which that individual actively interacts" (p. 3). The Actiotope Model of Giftedness is a systemic model with a focus on goal-directed actions toward skill development. The development of talents and extraordinary achievements is regarded as intelligent adaptation to the environmental stimuli (Ziegler, 2005). In the model three perspectives on actiotopes are distinguished: The component perspective, the dynamic perspective, and the systemic perspective (Ziegler et al., 2013).

The component perspective

In an actiotope, four components can be conceptually distinguished (Ziegler, 2005). First, each person has a unique *action repertoire* (see Figure 1). This repertoire refers to the total of all actions a person is able to perform in principle. During development and socialization, action repertoires expand considerably, increasing the capacity of an individual to interact effectively with his or her environment. Indeed, the development of excellence can be viewed as the development of an effective action repertoire that enables a person to meet the challenges of a domain such as mathematics, soccer or sculpture. The second component entails an individual's *goals*. A third component is the *environment* with which the person interacts. The fourth and final component is termed the *subjective action space*. This is located in a hypothesized mental space that generates action possibilities, which combine the other three components. That is, actions are selected from the *action repertoire* that might lead in a given *environment* to a particular *goal*. One underlying assumption of the Actiotope Model of Giftedness is that achievement and expertise levels are reflected in the differences in the actiotope components (Ziegler & Stoeger, 2008; Ziegler et al., 2014).

The dynamic perspective

Actiotopes are in a constant process of adaptation to changing inner states and changing environments. In order to manage this flux, Ziegler (2005) proposed five *dynamic functions*, as follows. Individuals must be able to create *action variants* in order to expand their action repertoire. They must also be able to assess the *correctness* of an action, that is, whether the desired goal has been attained as a result of executing an action (or se-

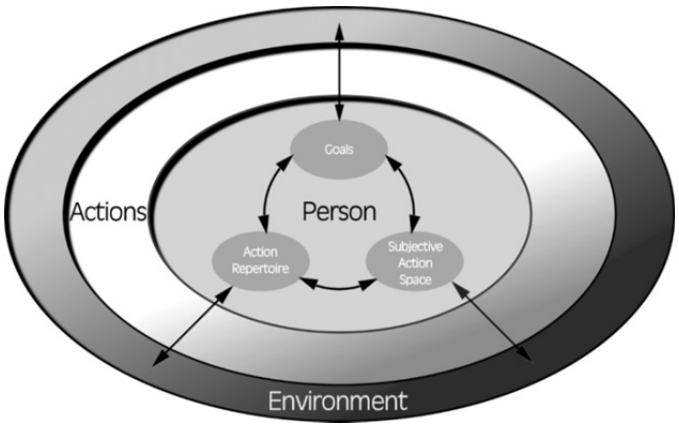

Figure 1:
The four components of an actiotope

quence of actions). Individuals need the capacity to recognize if a situation allows for the successful execution of an action (*applicability*). An actiotope must be *anticipative*, that is, individuals must build up effective action repertoires not only as a response to past events, but also in order to deal with novel challenges. Finally, individuals need effective *feedback*. This function requires access to ordered sequences of actions and information regarding their correctness. Examples are feedback loops like the TOTE strategy (Test-Operate-Test-Exit; see Miller, Galanter, & Pribram, 1960) or cycles of self-regulated learning (Stoeger, Sontag, & Ziegler, 2014).

The systemic perspective

Actiotopes as systems are usually quite stable configurations of their interacting elements. However, the development of excellence is an extreme process of adapting an actiotope and it has to undergo significant changes. In particular, the regulation type changes from a homeostatic regulation type to an allostatic regulation type (Ziegler & Baker, 2013). This means that the adaptation needs more resources than are available in the actiotope and therefore new resources have to be constantly added in order to ensure the actiotope's *modifiability* while maintaining its *stability*.

Learning resources in the Actiotope: Educational and learning capital

The educational implementation of systemic approaches like the Actiotope Model of Giftedness focus on the provision, optimization and effective use of resources. Ziegler and Baker (2013) distinguished between two kinds of resources, namely 'Educational Capital' and 'Learning Capital'. Educational capital is located in the environmental component of the actiotope and thus encompasses all exogenous resources that can be used to foster a person's learning progress in a domain. Learning capital is located in the person component of the actiotope and thus encompasses all endogenous resources that can be used to foster a person's learning progress in a domain. Table 1 gives an overview of the five forms of educational capital and the five forms of learning capital, along with examples to illustrate their significance for learning.

It is important to note that educational capital and learning capital are relational concepts. For example, an actiotope might be rich in resources for attaining extraordinary achievements in music, but not mathematics.

Educational and learning capital were originally assessed qualitatively in interviews. However, to meet the need for a more economical measurement instrument, the Questionnaire of Educational and Learning Capital (QELC) was developed by Ziegler et al. (2011) for teachers and later adapted by Vladut, Liu, Leana-Tascilar, Vialle, and Ziegler (2013) for students at elementary and secondary school levels. In previous studies, the QELC had shown satisfactory psychometric properties as well as factorial and concurrent validities. However, concurrent validities referred so far mainly to achievements and motivational variables (e.g., Vladut et al., 2013; Leana-Taşcılar, this issue).

Table 1:
Definitions and illustrations of the five forms of educational capital and the five forms of learning capital

Type of capital	Definition[4]	Illustration
Educational capital		
Economic educational capital	Economic educational capital is every kind of wealth, possession, money or valuables that can be invested in the initiation and maintenance of educational and learning processes. (p. 27)	The socio-economic status of a family strongly influences their children's academic success (Hanushek & Kimko, 2000; Lynn & Vanhanen, 2002; Rindermann, Sailer, & Thompson, 2009).
Cultural educational capital	Cultural educational capital includes value systems, thinking patterns, models and the like, which can facilitate - or hinder - the attainment of learning and educational goals. (p. 27)	In East Asian countries learning and education are more highly valued than in Western countries. This reflects in students' recent achievements (Phillipson, Stoeger, & Ziegler, 2013).
Social educational capital	Social educational capital includes all persons and social institutions that can directly or indirectly contribute to the success of learning and educational processes. (p. 28)	In many studies, a mentor has been shown to be of utmost importance for the development of excellence (Bloom, 1985a, 1985b).
Infrastructural educational capital	Infrastructural educational capital relates to materially implemented possibilities for action that permit learning and education to take place. (p. 28)	Educational toys, libraries or resource rooms at school.
Didactic educational capital	Didactic educational capital means the assembled know-how involved in the design and improvement of educational and learning processes. (p. 29)	Training based on superior didactic know-how can easily yield improved effect sizes of at least half a standard deviation (e.g. Lipsey & Wilson, 1993).

⇒

[4] The definitions are quotes from Ziegler & Baker (2013).

Type of capital	Definition[4]	Illustration
Learning capital		
Organismic learning capital	Organismic learning capital consists of the physiological and constitutional resources of a person. (p. 29)	Physical fitness is an important precondition, not only for physical activities and sports, but also for cognitive activities (Bellisle, 2004; Gottfredson, 2004).
Actional learning capital	Actional learning capital means the action repertoire of a person - the totality of actions they are capable of performing. (p. 30)	Elementary school students extend their action repertoire gradually and systematically by learning the basic arithmetical operations from initial simple mental counting processes prior to written calculations.
Telic learning capital	Telic learning capital comprises the totality of a person's anticipated goal states that offer possibilities for satisfying their needs. (p. 30)	Students who are alienated from school have very few or even no goals regarding their academic performance.
Episodic learning capital	Episodic learning capital concerns the simultaneous goal- and situation-relevant action patterns that are accessible to a person. (p. 31)	For example, a person who is skilled in a certain language is theoretically capable of saying any sentence in that language. But this does not guarantee, that this person will say the right thing, at the right time, in the right situation.
Attentional learning capital	Attentional learning capital denotes the quantitative and qualitative attentional resources that a person can apply to learning. (p. 31)	From a quantitative perspective, leisure activities can detract from the available time for learning (e.g. chatting, playing PC games, watching television), while anxieties can impair the quality of attention while learning.

Aims of the study

A basic assumption of the Actiotope Model of Giftedness is that an individual can more easily attain learning goals when greater exogenous and endogenous resources are available in the actiotope for attaining those learning goals (Ziegler & Baker, 2013). However, there is currently no research to corroborate this assumption. Thus, the first aim of our empirical study is to fill this gap. A second aim is to test the QELC's scope of application with students of a post-secondary educational level (United Nations Statistics Division, 2008).

Method

Participants

The sample consisted of 248 students, 89 male and 159 female students, aged from 16 to 20 years (M=17.83, SD=1.07). All participants attended different branches of the same vocational training school in Germany.

Materials and procedure

All 248 participants worked on the same standardized questionnaires. First, some demographic data of the participants such as gender, age, achieved level of education, and school achievement were assessed. Then, the Questionnaire of Educational and Learning Capital (QELC; Vladut et al., 2013) and the Actiotope Questionnaire (Ziegler, 2008; Ziegler et al., 2014) were administered. The QELC comprises 50 items whereby each form of educational or learning capital was measured by a subscale consisting of five items, presented along a six-point Likert-type scale ranging from (1) 'I disagree completely' to (6) 'I agree completely'. Sample items and reliabilities of the subscales can be found in Table 3. The Actiotope questionnaire consisted also of 50 items, each subscale consisting of five items, presented along a four-point Likert-type scale, ranging from 1 'I disagree completely' to 4 'I agree completely'. Sample items and reliabilities of the subscales can be found in Table 6.

Results

Results will be presented in three steps. First we will report descriptive statistics, reliabilities, sample items and zero-order correlations of the ten subscales of the QELC. In the second step, we will test the factorial validity of the QELC with the sample of post-secondary educational level participants and present the results of a two-factor CFA model. In the third and final step, concurrent validity will be reported by correlating the QELC data with the Actiotope data.

Introduction of the QELC: descriptive statistics, reliabilities, sample items and correlations of the ten subscales

Means *(M)* and standard deviations *(SD)* of the ten QELC subscales are presented in Table 2. All means were slightly above the scale mean, however, standard deviations were rather high ranging from 0.71 (actional learning capital) to 1.01 (organismic learning capital).

The reliabilities of the ten QELC subscales as well as sample items for each of the scales are presented in Table 3. The reliabilities of all scales of the QELC are in an acceptable range ($.62 \leq \alpha \leq .85$), however, they are lower than in previous studies (e.g., Vladut et al., 2013, Leana-Taşcılar, in this issue).

Table 4 contains the zero-order correlations for the ten QELC subscales. The correlations ranged from .147, between economic educational capital and organismic learning capital, to .749 between actional and episodic learning capital. All correlations were statistically significant.

Table 2:
Means *(M)*, standard deviations *(SD)* of the QELC subscales

QELC subscale	*M*	*SD*
Economic EC	3.82	0.99
Cultural EC	3.93	0.81
Social EC	3.79	0.80
Infrastructural EC	3.98	0.75
Didactic EC	3.48	0.85
Organismic LC	3.77	1.01
Actional LC	4.00	0.71
Telic LC	4.18	0.80
Episodic LC	4.26	0.81
Attentional LC	3.72	0.79

Table 3:
Reliabilities and sample items of the QELC subscales

QELC subscale	Cronbach's α	Sample item
Economic EC	.76	My family is willing to spend more money than others for learning.
Cultural EC	.74	In my social environment learning is considered to be very important.
Social EC	.74	My friends and my family support me in my learning.
Infrastructural EC	.75	I have optimum learning opportunities.
Didactic EC	.80	I use suggestions and tips on how I learn best.
Organismic LC	.85	My very good physical condition is a good basis for my continuous learning.
Actional LC	.62	I always know what exactly I can learn.
Telic LC	.68	I have set myself the target to learn more and more.
Episodic LC	.82	Due to various experiences, I know how I can achieve outstanding success.
Attentional LC	.74	I can concentrate without distractions on achieving learning outcomes.

Table 4:
Zero-order correlations of the QELC subscales

		2	3	4	5	6	7	8	9	10
1	Economic EC	.259**	.370**	.250**	.221**	.147*	.261**	.216**	.222**	.203**
2	Cultural EC		.472**	.397**	.203**	.353**	.331**	.363**	.365**	.353**
3	Social EC			.480**	.347**	.315**	.398**	.319**	.377**	.319**
4	Infrastructural EC				.526**	.607**	.661**	.621**	.589**	.629**
5	Didactic EC					.353**	.490**	.457**	.325**	.425**
6	Organismic LC						.619**	.508**	.499**	.552**
7	Actional LC							.680**	.749**	.630**
8	Telic LC								.673**	.727**
9	Episodic LC									.652**
10	Attentional LC									

Note: * $p < .05$; ** $p < .01$

Factorial validity of the QELC

In order to investigate the factorial validity of the QELC, a two-factor confirmatory factor analysis (CFA) was conducted. Based on prior theoretical considerations (Ziegler & Baker, 2013) and on prior empirical evidence (Vladut et al., 2013), a two-factor CFA model was specified in which economic educational capital (EC1), cultural educational capital (EC2), social educational capital (EC3), infrastructural educational capital (EC4), and didactic educational capital (EC5) loaded onto the latent variable of Educational Capital, and in which organismic learning capital (LC1), actional learning capital (LC2), telic learning capital (LC3), episodic learning capital (LC4), and attentional learning capital (LC5) loaded onto the latent variable of Learning Capital. These indicators were the subscales of the QELC and had a range of 5 to 30, with higher scores showing higher levels of the capital dimension.

Based on the theoretical assumptions and on the empirical evidence noted above, the latent factors of Educational and Learning Capital were permitted to correlate with one another, and economic educational capital (EC1) was permitted to be correlated with cultural (EC2), social (EC3), infrastructural (EC4), and didactic educational capital (EC5); respectively, organismic learning capital (LC1) was permitted to be correlated with actional (LC2), telic (LC3), episodic (LC4), and attentive learning capital (LC5). Economic educational capital (EC1) was used as marker indicator for Educational Capital, and organismic learning capital (LC1) was used as marker indicator for Learning Capital. The model was over-identified with 26 *df*. Figure 2 displays the complete specification of the two-factor CFA model.

The QELC was administered to 248 students who all had complete QELC data. The goodness of the model fit was assessed using the comparative fit index (CFI), the Tuck-

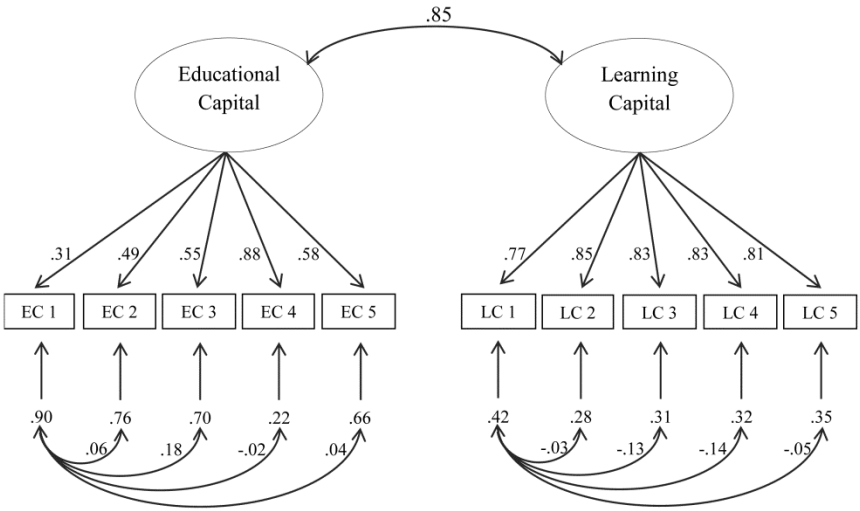

Figure 2:
Completely standardized parameter estimates from the two-factor CFA model of Educational and Learning Capital

er-Lewis index (TLI), the root mean square error of approximation (RMSEA) and its 90% confidence interval (90% CI), and the standardized root mean square residual (SRMR). These different indices were used in order to receive multiple information about the model fit, so that solution evaluation is more reliable (i.e., absolute fit, fit relative to a baseline model, fit adjusting for model parsimony). An acceptable model fit was defined guided by suggestions provided by Brown (2006). The criteria are: CFI (≥ .95), TLI (≥ .95), RMSEA (≤ .06, 90% CI ≤ .06), and SRMR (≤ .08). The fit indices suggested that the two-factor CFA model fit the data reasonably well, $\chi^2(26) = 87.51$, p = .00, CFI = .95, TLI = .91, RMSEA = .10 (90% CI = .08 - .12), SRMR = .04. Nevertheless, the examination of standardized residuals and modification indices indicated localized points of less optimal solution fit (e.g., largest standardized residual = 0.13, largest modification index = 21.86).

Factor loading estimates indicated that nearly all indicators were strongly related to their supposed latent factors (range of R^2s =.10 - .78). Only economic (EC1) and social educational capital (EC2) were rather low indicators (< .30). The approximations from the two-factor CFA solution indicate a strong relationship between the dimensions of Educational and Learning Capital (.85). This is in line with previous theoretical assumptions and empirical evidence. Moreover, the approximations from the two-factor CFA solution show a low relationship between the economic educational capital (EC1) with cultural (EC2; .06), social (EC3; .18), infrastructural (EC4; -.02), and didactic educational capital (EC5; .04); similar results were found for organismic learning capital (LC1) with, respectively, actional (LC2; -.03), telic (LC3; -.13), episodic (LC4; -.14), and attentive learning capital (LC5; -.05).

Validation of the QELC data with the Actiotope data: descriptive statistics, reliabilities, sample items and correlations of the Actiotope subscales

Means *(M)* and standard deviations *(SD)* of the ten Actiotope subscales are presented in Table 5. All means were within a range of 0.69 around the scale mean with a minimum of 2.09 (Feedback) and a maximum of 2.78 (Stability of the actiotope). The reliabilities and sample items of the ten Actiotope subscales can be found in Table 6. The reliabilities ranged from α=.30 to α=.75. In this study, the reliabilities were much lower than found with previous samples, indicating some problems with administering the Actiotope questionnaire to post-secondary students.

The zero-order correlations of the ten Actiotope subscales are presented in Table 7. The correlations ranged from .058 between subjective action space and action variants, to .539 between subjective action space and stability. As to be expected, most of the correlations reached statistical significance.

Table 8 contains the correlations between the QELC scales and between the subscales of the Actiotope questionnaire. The correlations ranged from -.045 among social educational capital and subjective action space, to .548 between attentional learning capital and anticipation. Despite the rather low reliabilities, most of the correlations reached statistical significance. It is interesting that – in terms of connectedness to learning processes – the more proximal learning capitals invariably were statistically significant in their correlations. By contrast, slightly less than one third of the 50 correlations of the Actiotope subscales and the more distal educational capital subscales proved to be non-significant. But even within the educational capital types, a difference could be observed between the more, and less, proximal subscales. All twenty correlations of the two, comparatively more proximal, infrastructural and didactic educational capitals were significant. By

Table 5:
Means *(M)*, standard deviations *(SD)* of the Actiotope questionnaire subscales

Actiotope subscale	*M*	*SD*
Subjective Action Space	2.69	0.48
Goals	2.77	0.44
Environment	2.76	0.40
Correctness	2.70	0.47
Applicability	2.49	0.47
Action Variants	2.29	0.51
Anticipation	2.43	0.51
Feedback	2.09	0.58
Modifiability	2.74	0.48
Stability	2.78	0.52

contrast, only four out of ten correlations of economic and cultural educational capital reached the set significance level, while social educational capital, which falls in between the distal and proximal educational capitals, had six significant correlations.

Table 6:
Reliabilities and sample items of the Actiotope questionnaire subscales

Actiotope subscale	Cronbach's α	Sample item
Subjective Action Space	.59	I know how I can learn successfully for school.
Goals	.47	It is important for me to improve how I study for school.
Environment	.30	It means a lot to my parents for me to be good in school.
Correctness	.59	In school I already know whether my answer is going to be right or wrong when I get called on in class and have yet to give my answer.
Applicability	.55	So far I have always been able to figure out whether I can use something in everyday life what I have learned in school.
Action Variants	.69	I like trying out new ways of coming to the same result at learning.
Anticipation	.61	I always follow a basic rule: It's better to learn too much than too little before a class test.
Feedback	.75	I am regularly notified from my teachers about what I can already do well and where I need to keep working.
Modifiability	.50	I would have no problem with studying more for school.
Stability	.70	It doesn't throw me off when I fail at something in school.[5]

[5] Reversly coded.

Table 7:
Zero-order correlations of the Actiotope questionnaire subscales

		2	3	4	5	6	7	8	9	10
1	Subjective Action Space	.089	.063	.315**	.476**	.058	.070	.076	.379**	.539**
2	Goals		.314**	.163*	.134*	.311**	.415**	.128*	.265**	.196**
3	Environment			.326**	.110	.289**	.377**	.290**	.117	.316**
4	Correctness				.329**	.279**	.359**	.351**	.294**	.511**
5	Applicability					.270**	.229**	.227**	.283**	.489**
6	Action Variants						.438**	.393**	.233**	.290**
7	Anticipation							.320**	.238**	.357**
8	Feedback								.098	.196**
9	Modifiability									.400**
10	Stability									

Note: * $p < .05$; ** $p < .01$

Table 8:
Zero-order correlations between the subscales of the QELC and the Actiotope questionnaire

	Subjective Action Space	Goals	Environment	Correctness	Applicability	Action Variants	Anticipation	Feedback	Modifiability	Stability
Economic EC	.019	.114	.213**	.092	.113	.167**	.221**	.161*	.026	.064
Cultural EC	.021	.182**	.248**	.086	.031	.245**	.217**	.088	-.027	-.004
Social EC	-.045	.217**	.183**	.130*	.110	.259**	.325**	.270**	.025	.060
Infrastructural EC	.241**	.339**	.372**	.364**	.292**	.396**	.384**	.288**	.237**	.464**
Didactic EC	.231**	.339**	.331**	.266**	.244**	.332**	.293**	.407**	.163*	.250**
Organismic LC	.370**	.246**	.272**	.264**	.363**	.324**	.239**	.224**	.297**	.412**
Actional LC	.327**	.300**	.368**	.477**	.379**	.402**	.479**	.378**	.338**	.508**
Telic LC	.213**	.519**	.270**	.366**	.281**	.381**	.506**	.265**	.278**	.383**
Episodic LC	.236**	.378**	.305**	.487**	.283**	.393**	.467**	.306**	.278**	.524**
Attentional LC	.181**	.392**	.249**	.344**	.277**	.438**	.548**	.372**	.254**	.402**

Note: * $p < .05$; ** $p < .01$

Discussion

A basic assumption of the Actiotope Model of Giftedness is that the likelihood for a successful adaptation of an actiotope towards excellence is critically dependent on the availability of learning resources (Ziegler & Baker, 2013; Ziegler et al., 2013). However, no empirical evidence has been offered so far to substantiate this claim. In order to fill this research gap, the Actiotope questionnaire (Ziegler, 2008) and the QELC (Vladut et al., 2013) were administered to post-secondary students. The QELC is an economical quantitative measuring instrument of educational and learning capital, which was previously used in large-scale surveys with older primary school students and secondary school students. Thus, the current study also provides information on whether the QELC can be used with older students.

Although reliabilities of the ten QELC subscales were in the satisfactory range, some effort should be taken to improve some of the subscales. This suggestion applies particularly to the subscales that measure actional learning capital (α=.62) and telic learning capital (α=.68). Nevertheless, the results showed that a quantitative measurement of educational and learning capitals seems to be possible. The fit indices of the two-factor CFA model generally fitted the data well. The five forms of educational capital loaded onto one latent variable and the five forms of learning capital loaded onto the other latent variable.

The concurrent validation of the QELC was compromised by unexpected low reliabilities of the subscales of the Actiotope questionnaire (Ziegler, 2008), which hitherto had not been observed. There is one potential explanation for the low reliabilities. Reliability was assessed with Cronbach's α. However, this method of assessing reliability assumes the homogeneity of the items. Our sample consisted of students from a German vocational training school. Such schools are based on a dual education system that combines apprenticeships and vocational education at a vocational training school (for details see Federal Ministry of Education and Research, 2005). The apprenticeships differed among the students, indicating diverse occupations on graduation. Thus, the actiotopes might be simply too heterogeneous to allow for an internal consistency reliability measure such as Cronbach's α. For example, the subscale with the lowest reliability, 'environment', tapped such diverse aspects of a student's learning environment as the quality of school, the teaching expertise of the teachers, and the functionality of the home study space. Therefore, in future studies alternative measures of reliability such as test-retest reliability or parallel-forms reliability should be used.

Nevertheless, despite the reliability problems, the expectation of significant correlations between educational and learning capitals and the Actiotope variables was predominantly confirmed. Of the 100 correlations, 84 reached the set significance level. Interestingly, the non-significant correlations were confined to correlations between three educational capital subscales (economic educational capital, cultural educational capital, and social educational capital) and Actiotope subscales. These three educational capital subscales measure exogenous learning resources that are more distal to the learning process than the other seven subscales. Though infrastructural and didactic educational capitals are also exogenous learning resources, they are part of each learning process (either as a

situational frame such as infrastructural educational capital or as a structure of the learning process such as didactic educational capital). Indeed, all correlations of these two forms of educational capital and Actiotope subscales were significant. Therefore, the results of the empirical study support the basic assumption of contextual theories of giftedness (Barab & Plucker, 2002), such as the Actiotope Model of Giftedness, that the availability of learning resources is a critical factor for learning towards excellence (Ziegler & Baker, 2013; Ziegler et al., 2013).

Limitations of the study

First of all, the Actiotope Model of Giftedness is a systemic approach and empirical studies based on linear algebra might not be the most suitable to model reality. However, as the aim of this contribution was to establish the link between the adaptability of the Actiotope and the availability of resources within the Actiotope, this only means that hypotheses were tested under more averse conditions. A second limitation is that we conducted a cross-sectional study and the concurrent validations do not establish any causal relationship. A third limitation are the rather low reliabilities of some subscales of the Actiotope questionnaire. Thus, the magnitude of the concurrent validity coefficients might be underestimated.

References

Barab, S. & Plucker, J. (2002). Smart people or smart contexts? Cognition, ability, and talent development in an age of situated approaches to knowing and learning. *Educational Psychologist, 37*(3), 165-182.

Bellisle, F. (2004). Effects of diet on behavior and cognition in children. *British Journal of nutrition, 92*, 227-232.

Bloom, B. S. (1985a). *Developing talent in young people*. New York: Ballantine Books.

Bloom, B. S. (1985b). Generalizations about talent development. In B. S., Bloom (Ed.), *Developing talent in young people* (pp. 507–549). New York: Ballantine Books.

Brown, T. A. (2006). *Confirmatory Factor Analysis for Applied Research.* New York: The Guilford Press.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention.* New York: Harper perennial.

Federal Ministry of Education and Research (2005). *Reform of vocational education and training*. http://www.bmbf.de/en/1644.php. Retrieved 02-01-2015.

Gagné, F. (2009). Debating giftedness: Pronat vs. Antinat. In L. V. Shavinina (Ed.), *International handbook on giftedness* (pp. 155-198). Dordrecht, Netherlands: Springer.

Gagné, F. (2013). The DMGT: Changes within, beneath, and beyond. *Talent Development and Excellence, 5*, 5-19.

Gottfredson, L. S. (2004). Life, death, and intelligence. *Journal of Cognitive Education and Psychology, 4*, 23-46.

Hanushek, E. A. & Kimko, D. D. (2000). Schooling, labor-force quality, and growth of nations. *American Economic Review, 90*, 1184–1208.

Heller, K. A., Perleth, Ch., & Lim, T. K. (2005). The Munich Model of Giftedness designed to identify and promote gifted students. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of Giftedness* (pp. 147-170). New York: Cambridge University Press.

Leana-Taşcılar, M. Z. (2015). Age Differences in the Actiotope Model of Giftedness in a Turkish Sample. *Psychological Test and Assessment Modeling, 57,* 111-125.

Lipsey, M. W. & Wilson, D. B. (1993). The efficacy of psychological, educational, and behavioral treatment. *American Psychologist, 48*, 1181–1201.

Lynn, R. & Vanhanen, T. (2002). *IQ and the wealth of nations.* Westport, CT: Praeger.

Miller, G. A., Galanter, E., & Pribram, K. A. (1960). *Plans and the structure of behaviour*. New York: Holt, Rhinehart, & Winston.

Mönks, F. J. & Mason, E. J. (2000). Developmental psychology and giftedness: Theories and research. In K. A. Heller, F. J. Mönks, R. Sternberg, & R. Subotnik (Eds.), *International handbook of research and development of giftedness and talent* (pp. 141-155). Oxford, UK: Pergamon.

Phillipson, S., Stöger, H., & Ziegler, A. (Eds.) (2013) *Development of excellence in East-Asia: Explorations in the Actiotope model of giftedness.* London: Routledge.

Renzulli, J. S. (1986). The three-ring conception of giftedness: A developmental model for creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 53-92). New York: Cambridge University Press.

Renzulli, J. S. (2005). The three-ring definition of giftedness: A developmental model for promoting creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 246–280). New York: Cambridge University Press.

Rindermann, H., Sailer, M., & Thompson, J. (2009). The impact of smart fractions, cognitive ability of politicians and average competence of peoples on social development. *Talent Development & Excellence, 1*, 3–25.

Stoeger, H. & Gruber, H. (2014). Cultures of expertise: The social definition of individual excellence. *Talent Development and Excellence, 6(1)*, 1–10.

Stoeger, H., Sontag, C., & Ziegler, A. (2014). Impact of a teacher-led intervention on preference for self-regulated learning, finding main ideas in expository texts, and reading comprehension. *Journal of Educational Psychology, 106*, 799–814.

United Nations Statistics Division (2008). *International Standard Industrial Classification of all economic activities.* http://unstats.un.org/unsd/cr/registry/isic-4.asp. Retrieved 02-01-2015.

Vladut, A., Liu, Q., Leana-Tascilar, M. Z., Vialle, W., & Ziegler, A. (2013). A Cross-Cultural Validation Study of the Questionnaire of Educational and Learning Capital (QELC) in China, Germany and Turkey. *Psychological Test and Assessment Modeling, 55(4),* 462-478.

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

Ziegler, A. (2008). *Fragebogen zur Erfassung des schulischen Aktiotops [Actiotope questionnare]*. Ulm: University of Ulm. Unpublished manuscript.

Ziegler, A. & Baker, J. (2013). Talent development as adaptation: The role of educational and learning capital. In S. Phillipson, H. Stoeger, & A. Ziegler (Eds.), *Exceptionality in East Asia: Explorations in the Actiotope model of giftedness* (pp. 18-39). London: Routledge.

Ziegler, A. & Phillipson, S. (2012). Towards a systemic theory of giftedness. *High Ability Studies, 23*, 3-30.

Ziegler, A. & Stoeger, H. (2008). A learning oriented subjective action space as an indicator of giftedness. *Psychology Science Quarterly*, *50*, 222-236.

Ziegler, A., Hopp, M., Linner, M., Schöferle, T., Thomas, N., Schielein, T. Vladut, A. & Götzfried, W. (2011). Bildungs- und Lernkapitalarmut von Hauptschülern: Ergebnisse einer explorativen Befragungsstudie mit Lehrkräften [Poverty of educational and learning capital of students: Results of an explorative study with teachers]. *Schulpädagogik-heute, 2*. (Online: file:///C:/Users/A.Ziegler/Downloads/SH5_44.pdf)

Ziegler, A., Stoeger, H., Harder, B., Park, K., Portešová, S., & Porath, M. (2014). Gender differences in mathematics and science: The role of the actiotope in determining individuals' achievements and confidence in their own abilities. *High Ability Studies, 25*, 35-51.

Ziegler, A., Vialle, W., & Wimmer, B. (2013). The Actiotope Model of Giftedness: A short introduction to some central theoretical assumptions. In S. Phillipson, H. Stoeger, & A. Ziegler (Eds.), *Exceptionality in East-Asia: Explorations in the Actiotope model of giftedness* (pp. 1-17). London: Routledge.

Ziegler, A., Vladut, A., Leavitt, M., & Speckenheuer, R. (2012). Educational and learning capital of a world champion. *Talent Talks, 3(1)*, 24-28.