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Validation study of the Questionnaire of Educational and Learning Capital (QELC) in Israel

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Abstract

The Actiotope Model of Giftedness regards giftedness as a product of the interaction between the individual and the environment. The aim of this study is to evaluate the validity of the *Questionnaire of Educational and Learning Capital* (QELC) on 187 primary school students from Israel and to examine whether the educational and learning capitals of the students are associated with general intelligence and academic achievement. In the study correlations were found between *social*, *infrastructural*, *didactic*, *organismic*, *actional*, *episodic* and *attentional* capitals. No correlations were found, however, between general intelligence and other subscales of the QELC. The results of reliabilities and the two-factor CFA model affirmed the validity of the educational and learning capital using the Hebrew version of QELC.

Keywords: giftedness, actiotope, QELC, general intelligence, academic achievements

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Introduction

Traditional approaches advocate the perception that giftedness is related to internal entities (Ziegler & Baker, 2013). By contrast, ecological and systemic approaches consider not only the person but also the environment (Davidson, 2009). These models address not only the person's faculties but the impact of the environment to which the person functionally adapts (Gruber, Jansen, Marienhagen, & Altenmueller, 2010; Vicente & Wang, 1998; Ziegler, 2005). The Actiotope Model of Giftedness regards giftedness as a product of the interaction between the individual and the environment in which he or she acts (Ziegler & Baker, 2013; Ziegler, Stoeger & Grassinger, 2011; Ziegler, 2005).

The *Questionnaire of Educational and Learning Capital* was developed to assess students' educational and learning capital based on the Actiotope Model of Giftedness (Vladut, Liu, Leana-Taşcılar, Vialle & Ziegler, 2013). A cross-cultural validation study performed by Vladut et al. (2013) affirms that the QELC retains satisfactory psychometric properties as well as construct and concurrent validity. No study has yet addressed the educational and learning capital of students in Israel. The present study aimed to examine the validity of QELC in Israel and the possible links between the educational and learning capitals of the student's general intelligence and their academic achievements.

Theoretical background

Giftedness is not only relative inherent to the individual, but also relative to the environment with which that individual actively interacts (Ziegler, Vialle, & Wimmer, 2013). The Actiotope Model addresses giftedness, or excellence, as the consequence of a large number of successful adaptations to environmental determinants (Ziegler, 2005). Therefore, individuals who have attained excellence are those with the most effective action repertoires at their disposal. Furthermore, to successfully pursue excellence in a particular domain a broader range of complex and challenging goals needs to be conquered (Ziegler, 2005; Ziegler, Vialle, & Wimmer, 2013).

Both exogenous and endogenous resources are key factors in the pursuit of excellence. These resources were termed by Ziegler and Baker (2013) "educational capital" and "learning capital", respectively. Educational capital implements external resources used to build up an effective action repertoire. Five forms of educational capital were distinguished by Ziegler and Baker (2013): *economic*, *cultural*, *social*, *infrastructural*, and *didactic*. Learning capital implements internal resources which refer exclusively to the individual and his/her ability to expand the scope of education and learning. Learning capital includes: *organismic*, *actional*, *telic*, *episodic*, and *attentional* resources (Ziegler, 2005).

Educational capital

Economic capital refers to every kind of wealth, property and money, as well as any other valuables, that can be used by the society to sustain educational and learning processes (Ziegler & Baker, 2013; p. 13). Several studies have shown that the socioeconomic status of families has a strong impact on students' academic achievements (Bornstein & Bradley, 2003; Sirin, 2005). The family's socioeconomic status sets the stage for students' academic performance both by directly providing resources at home and by indirectly providing the social resources that are needed to succeed in school (Coleman, 1988).

Cultural capital includes value systems, thinking patterns, models and the like, which can facilitate or hinder the attainment of learning and educational goals (Ziegler & Baker, p. 27). The research literature contains several suggestions regarding the way culture influences the emergence of excellence. For example, Steele, James and Barnett (2002) assert that women in male-dominated academic majors reported feeling threatened by negative gender stereotypes and were more likely than male students to consider changing their major. Stereotypes held by teachers based on cultural differences among their students, is another example of the effect of cultural capital on student's achievements in school. Leopold and Shavit's study (2011) showed that teachers in Israel tend to be culturally prejudiced, favoring native-born students over immigrants from the Former Soviet Union, for example, and assigning higher grades to the former.

Another form of educational capital is *social capital* that comprises all persons and social institutions that can directly or indirectly contribute to the success of learning and educational processes (Ziegler & Baker, 2013, p.28). *Social educational capital* includes, besides teachers, mentors or engaged parents, scholarships, sponsorships and associations.

Numerous studies document the positive influence of *social capital* on children's and adolescents' well-being (e.g. Parcel, Dufur, & Cornell Zito, 2010; Israel, Beaulieu, and Hartless 2001). Israel, Beaulieu & Hartless, (2001) demonstrated that the students who are more likely to attain higher test scores and to stay in school without dropping out are those that discuss school programs and school issues with their parents, whose parents expect them to attend college and who restrict the amount of TV time at home. Crosnoe (2004) found that student-teacher bonding at school compensates for parent-adolescent emotional distance. Kim and Schneider (2005) noted that active parental participation in postsecondary school guidance programs is more beneficial to students whose parents have a lower level of educational attainment.

Infrastructural capital relates to materially implemented possibilities for actions that permit learning and education to take place (Ziegler & Baker, 2013, p. 28). It includes preschools equipped with high-quality play and learning materials, schools with superior learning media, and more. School resources, including learning materials, computers, student-teacher ratio and other factors have been shown to be important (e.g., Krueger, 2003). For example, the "Dovrat Committee" (2005) in Israel argued that gaps in academic accomplishments between Jewish and Arab students could be bridged by improv-

ing the resources allocated to the Israeli Arab schools. In response, the Ministry of Education issued a 5-year plan aimed at improving education in the Israeli Arab schools.

The last form of educational capital is *didactic capital* which addresses the assembled expertise involved in the design and improvement of educational and learning processes (Ziegler & Baker, 2013, p. 29). Previous research has shown that a technology-rich learning environment can promote higher-order thinking skills, learning motivation, and teamwork (Rosen, 2009; Rosen & Salomon, 2007). One example is the Israeli learning environment program named "Time To Know" aimed to enrich didactic capital. The program consists of an interactive core curriculum and a digital teaching platform designed for computerized classrooms. Rosen and Beck-Hill (2012) found that the program favored teacher-student interaction and enriched the number and types of teaching models employed per class.

Learning capital

Learning capital represents endogenous resources intended to assist students in constructing an effective action repertoire. The first form that Ziegler and Baker (2013, p. 35) proposed is *organismic learning capital*, which consists of the physiological and constitutional resources of the individual. Recent research has documented a positive relationship between physical fitness and academic achievement or other cognitive performance measures (Castelli, Hillman, Buck, & Erwin, 2007; Shephard, 1997). Exercise was found to be an important contributing factor to different aspects of children's mental functioning, central to cognitive development (Tomporowski, Davis, Patricia & Naglieri, 2008).

Another form of learning capital proposed by Ziegler and Baker (2013) is *actional capital*. By definition, *actional capital* means the action repertoire of a person – the totality of actions they are capable of performing (Ziegler & Baker, 2013, p. 60). These include cognitive activities, such as arithmetic skills, movement sequences in sports, and linguistic skills (Ziegler & Baker, 2013; p. 35).

Telic capital refers to the availability of learning goals. For example, students who are alienated from school may have very few or, in extreme cases, no learning objectives (Ziegler & Baker, 2013; p. 35). The study of Ziegler, Stoeger and Grassinger (2011) on learning strategies showed that students who demonstrated a more adaptive Actiotope reported preferential use of goal setting in their learning process, planned their learning more thoroughly, and made more frequent use of monitoring and regulating strategies during their learning process.

Episodic capital addresses the simultaneous goal and situation-relevant action patterns that are accessible to the individual (Ziegler & Baker, 2013, p.31). Episodic learning capital is associated with the experience gained by the student and focuses on the meaningful use of his action repertoire.

Ziegler et al. (2014) maintain that *episodic learning capital* denotes the cognitive resources that help the individual choose the appropriate actions for achieving desired

goals in a given situation. Attainment of excellence is a relevant example of *episodic learning capital*. Most researchers relate to excellence as the end result of a lengthy learning process. As the individual grows and develops, he/she employs at least 10,000 active, concentrated hours of learning episodes (Ericsson, Charness, Feltovich, & Hoffman, 2006; Ericsson, 2007).

Ultimately, Ziegler and Baker (2013) proposed the *attentional capital* that highlights the quantitative and qualitative attentional resources that the individual can apply to learning (p. 35). Gifted students are able to stay focused on an assignment and to selectively attend to relevant stimuli while filtering irrelevant stimuli in a rapid manner (Schweizer, et al., 2000; Schweizer & Moosbrugger, 2004).

Aims of the study

The *Questionnaire of Educational and Learning Capital* (QELC) was developed to assess students' educational and learning capital based on the Actiotope Model of Giftedness (Vladut et al., 2013).

To date, no study has examined the QELC in Israel. The first aim of this study is to investigate the validity of the Hebrew QELC version on fifth grade students. A second aim is to examine the interrelationships between educational and learning capitals, general intelligence and academic achievement.

Method

Participants and procedure

The participants in this study were 187 fifth grade students from Israel (88 girls, 98 boys; mean age= 10.70, *SD*= 0.4). The students were from five different randomly selected primary schools located in northern Israel. All of the participants completed the Israeli version of the QELC. One hundred twenty-two participants also completed the Raven test and a mathematical achievement test. Participants were volunteers who were not rewarded for their participation in the study. The students and their parents signed informed consent forms.

Measures

Questionnaire of Educational and Learning Capital (QELC)

The QELC consists of 10 subscales. Each subscale measures one of the 10 types of capital using five different items. All items on the QELC were presented along with a 6-point Likert-type scale ranging from 1 (completely disagree) to 6 (completely agree). The scores ranged from 5 to 30, higher scores reflecting higher levels of the relevant capital. Recently, a cross-cultural validation study showed that the psychometric qualities of the

QELC were predominantly acceptable and that it is, indeed, a reliable cross-cultural questionnaire (Vladut et al., 2013).

General intelligence

The entire research population was examined using Raven's Advanced Progressive Matrix Test (RPMT) (Raven, Raven & Court, 2000). Shortened Raven test containing 30 items (adopted from Zohar, 1990) was used. Each item has a 3 x 3 matrix with a missing cell. For each item, the participant selects the option from among eight possible answers, which completes the given matrix. Items are presented in black ink on a white background, and become increasingly more difficult to solve as the participant progresses through each set. The test time limit is 15 minutes. The range varies from 0 to 30 and denotes the number of problems solved correctly.

Mathematical achievement test

The mathematical achievement test was composed of 18 arithmetic problems based on the country's fifth grade curriculum in mathematics. The test time limit was 50 minutes. Some questions were simple exercises requiring basic techniques while others were more complicated, requiring a high level of thinking, problem-solving, reasoning, and integration of information skills and the solicitation of previously assimilated knowledge within new contexts.

The tasks included four operations with whole numbers (addition, subtraction, multiplication, and division), including multistep word problems, entailing comprehension of the place value system, basic understanding of fractions, distinguishing between angles, and knowledge of the properties of triangles and squares.

Data analyses

The statistical analyses were performed in two steps.

Step I:

The first analysis included reliabilities of the 10 scales of the QELC and correlations between the QELC subscales, general intelligence and mathematical achievement tests. Additionally, an independent T-test was used to examine gender differences in the QELC scales.

Step II:

Confirmatory factor analysis (CFA) was performed to examine a two-factor model inclusive of the latent variable of educational capital, composed of *economic*, *cultural*, *social*, *infrastructural* and *didactic* forms, whereas the latent variable of learning capital was composed of *organismic*, *actional*, *telic*, *episodic* and *attentional* forms. The 'goodness

of fit' model was assessed using the following indicators: comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root mean square error of approximation (RMSEA).

Results

Step I: Reliabilities, descriptive statistics and correlations

The reliabilities of the 10 scales for all the participants ranged within $0.625 \leq 0.811$ (Cronbach's α is displayed in Table 1). An independent T-test was conducted to examine gender differences in the QELC scales. In *economic* capital girls perceived that they had significantly higher levels (M=25.65, SD=3.79) than boys did (M=24.44, SD=4.30) (t(184.85)=-1.99; $p < .05$). Additionally, in *telic* capital, girls perceived having significantly higher levels (M=22.62, SD=5.19) than boys (M=24.35, SD=3.65) (t(174.39)=-2.65; $p < .05$).

Table 1:
Examples of items from the QELC and reliability of each sub-scale

	Form of Capital	Example item	Cronbach's α
Educational Capital	*Economic*	My family invests money in order that I can improve my academic performance.	.735
	Cultural	I know a lot of people who think that learning and studying are very important.	.742
	Social	I always know where I can find support and advice for learning and studying.	.726
	Infrastructural	My studying environment is well suited to school.	.687
	Didactic	I have very good classroom instruction in all my subjects.	.753
Learning Capital	*Organismic*	I feel physically fit when I am learning and studying for school.	.625
	Actional	I know a lot of strategies for learning and studying.	.693
	Telic	I always know precisely what my next learning or studying goal is.	.757
	Episodic	I already have a lot of experience on how to learn and study the right way.	.811
	Attentional	I can focus completely on my learning and studying for school.	.796

Table 2:
Means (M), standard deviations (SD), and correlations for the subscales of the QELC, general intelligence and mathematical achievement test

	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1.General Intelligence	17.90 (3.66)	1	.390**	.006	-0.91	.018	.182*	.110	.028	.150	-.056	.129	.069
2. Mathematical achievement test	71.86 (20.00)		1	.143	.138	.250**	.281**	.207*	.190*	.241**	.116	.185*	.201*
3. Economic	25.00 (4.10)			1	.355**	.388**	.437**	.241**	.415**	.360**	.415**	.391**	.226**
4. Cultural	23.98 (4.39)				1	.661**	.592**	.509**	.469**	.563**	.544**	.489**	.401**
5. Social	23.24 (4.60)					1	.656**	.615**	.576**	.644**	.609**	.645**	.460**
6. Infrastructural	24.40 (3.81)						1	.593**	.643**	.696**	.564**	.663**	.580**
7. Didactic	23.37 (4.09)							1	.575**	.606**	.557**	.621**	.400**
8. Organismic	23.25 (4.10)								1	.614**	.614**	.659**	.655**
9. Actional	23.72 (4.22)									1	.706**	.774**	.547**
10. Telic	23.44 (4.59)										1	.690**	.545**
11. Episodic	23.18 (4.80)											1	.573**
12. Attentional	20.44 (5.59)												1

Notes: *P<0.05; **P<0.01

Table 2 contains the means (*M*), standard deviations (*SD*) and correlations for the subscales of the QELC in Israel. Correlations between *economic* capital and each of the educational capitals (*cultural*, *social*, *infrastructural* and *didactic*) were low or moderate (ranging from 0.241 to 0.437). Correlations between *cultural*, *social*, *infrastructural* and *didactic* capital were moderate or high (ranging from 0.509 to 0.661). Correlations between each of the learning capital forms (*organismic*, *actional*, *telic*, *episodic*, *and attentional*) were moderate or high (ranging from 0.545 to 0.754). High correlation was found between *actional*, *telic* and *episodic* capital (ranging from 0.690 to 0.774).

Significant weak correlation was found between students' scores on the Raven test and *infrastructural* capital (r = .182). No correlations were found between student's scores on the Raven test and other subscales of the QELC (Table 2). Significant correlations were found between students' scores on the mathematical achievement test and *social*, *infrastructural*, *didactic*, *organismic*, *actional*, *episodic* and *attentional* capitals. *Economic, cultural* educational capitals and *telic* learning capital were not correlated to the mathematical achievement test (Table 2).

Step II: Confirmatory Factor Analysis

Confirmatory Factor Analysis was performed based on data obtained from 187 fifth-grade students who completed the QELC. We hypothesized a two-factor model in which the latent variable of educational capital comprises the *economic*, *cultural*, *social*, *infrastructural* and *didactic* forms, while the latent variable of learning capital comprises the *organismic*, *actional*, *telic*, *episodic* and *attentional* forms (Figure 1).

Factor loading estimates showed that nearly all indicators were strongly related to their supposed latent factors. Only the *economic* capital was a low indicator (0.48). High correlation between the educational and learning capital dimensions (0.93) is shown. The fit indices suggested that the two-factor CFA model fits the data well for the most part: $\chi^2(23) = 39.67$, $p = 0.17$, CFI = 0.96, TLI = 0.97, RMSEA = 0.062.

Discussion

This study evaluated the validity of the QELC on primary school students in Israel and examined whether the educational and learning capitals of the students tested were associated with general intelligence and academic achievement. The results of both the reliabilities and the two-factor CFA model confirmed the validity of the educational and learning capital using the Hebrew version of QELC. The results display no correlation between general intelligence and other subscales of the QELC, except for a significant weak correlation with *infrastructural* capital. A linkage between academic achievements in mathematics and *social*, *infrastructural*, *didactic*, *organismic*, *actional*, *episodic* and *attentional* capitals is suggested. Gender differences were found with regard to *economic* and *telic* capitals.

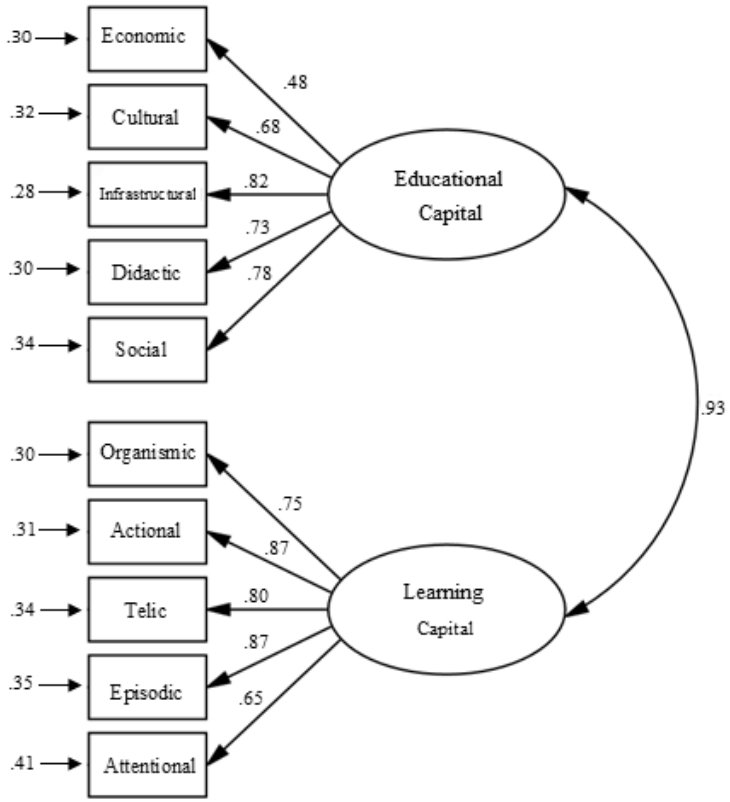

Figure 1:
Two-factor CFA model of Educational and Learning Capital for the Hebrew version

Based on prior theoretical assumptions a two-factor CFA model was constructed. The fit indices indicated that the two-factor CFA model fit the data well to a great extent. These findings are in line with results of Vladut et al. (2013) which confirmed the validity of the QELC construct in China, Germany and Turkey.

Gender differences were found with regard to *economic* and *telic* capitals, in favor of the girls. It seems that girls set more goals and regulating strategies in their learning process compared to boys. These results are in line with Vladut et al. (2013) and Leana-Taşcılar (2015) studies. Ablard and Lipschultz (1998) found that girls reported greater use of self-regulated learning strategies.

Correlation analysis showed that there were significant correlations between academic achievements in mathematics and the *infrastructural* and *didactic* educational capitals. However, no correlations were found between *cultural* and *economic* educational capitals and academic achievements in mathematics. It seems that the didactic resources at school and the learning materials both at home and at school are what may underlie

higher achievements. These findings corroborate previous studies that highlight the importance of environmental factors for learning (e.g. Stoeger & Sontag, 2012).

Furthermore, correlations were found between academic achievements in mathematics and the *social* capital but not as regards the *cultural* capital. *Social* educational capital refers to the way in which society has a direct influence on the child and the extent to which parents or friends assist children in learning, whereas the cultural educational capital focuses on values and attitudes that can assist or delay students' achievements (Ziegler & Baker, 2013). These findings suggest that academic achievements of Israeli students are influenced by social, rather than cultural, resources.

This study shows that the *economic* capital was not correlated with achievements in mathematics. This can be explained by the fact that parents of students with learning difficulties and those of high achievers equally invest financial resources in their children's learning. For example, The Israel National Council for the Child (2013), published statistics revealing that 40% of students in fifth through ninth grade are assisted by private tutoring in English and/or mathematics. Further research is needed to examine the relationship between *economic* capital and academic achievements.

The results reveal links between academic achievements in mathematics and *organismic*, *actional*, *episodic* and *attentional* capitals, but not with *telic* learning capital. These results are in line with research conducted by Leana-Taşcılar (2015) that examined correlations between the educational and learning capitals of 4th, 7th, and 10th graders. It seems that high achieving students were more likely to report using strategies for studying and having expertise in effective learning and studying strategies. However, these students did not report setting learning goals for themselves. These findings depict a unique and interesting image of the learning culture of Israeli students.

The current study found no correlation between general intelligence and the educational and learning capitals. This finding indicates that general intelligence and educational and learning capitals are two separate entities and supports the assumption of the Actiotope Model of Giftedness which maintains that giftedness is sustained by the interaction between the individual and the environment (Ziegler & Baker, 2013; Ziegler, 2005). The lack of a distinct connection between general intelligence and educational and learning capitals highlights the importance of QELC as an additional tool for identifying gifted children.

To sum up, the study affirms that the QELC can derive psychometric assets in an Israeli sample. The correlation analyses confirm that the QELC is a useful tool for detecting gifted students and they validate the assumption that academic success is influenced by both the individual and the environment. These study findings can be grounded directly in school practice, as they shed light on important aspects of teaching and learning processes that hold promise for enriching opportunities for attaining excellence and giftedness.

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References

Afana, Y., Lietz, P., & Tobin, M. (2013). The relationship between school resources and grade 8 mathematics achievement: A comparison of Palestinian Authority, Israeli Hebrew and Israeli Arab schools in TIMSS 2007. *Journal for Educational Research Online/Journal für Bildungsforschung Online*, 5(1), 59-89.

Bornstein, M. C., & Bradley, R. H. (Eds.). (2003). *Socioeconmic status, parenting, and child development.* Mahwah, NJ: Lawrence Erlbaum.

Bull, R., & Johnston, R. (1997). Children's arithmetical difficulties: Contribution from processing speed, item identification, and short-term memory. *Journal of Experimental Child Psychology*, *65*(1), 1–24.

Castelli, D. M., Hillman, C. H., Buck, S. M., & Erwin, H. E. (2007). Physical fitness and academic achievement in third-and fifth-grade students. *Journal of Sport and Exercise Psychology*, *29*(2), 239.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94,* S95–S120.

Crosnoe, R. (2004). Social capital and the interplay of families and schools. *Journal of Marriage and Family*, *66*(2), 267-280.

Davidson, J. (2009). Contemporary models of giftedness. In L. Shavinina (Ed.), *International handbook of giftedness* (1st ed., pp. 81-99). Amsterdam: Springer.

Dovrat, S. (Ed.). (2005). *Task force for the advancement of education in Israel, Dokh Dovrat [Dovrat Report]* English summary of the report available at http://cms.education.gov.il/EducationCMS/Units/Ntfe/HdochHsofi/DochSofi.htm

Ericsson, K.A., & Ward, P. (2007). Capturing the naturally occurring superior performance of experts in the laboratory: Toward a science of expert and exceptional performance. *Current Directions in Psychological Science*, 16, 346-350.

Ericsson, K.A., Charness, N., Feltovich, P., & Hoffman, R. (Eds.). (2006). *Cambridge handbook on expertise and expert performance*. Cambridge, UK: Cambridge University Press.

Gruber, H., Jansen, P., Marienhagen, J., & Altenmueller, E. (2010). Adaptations during the acquisition of expertise. *Talent Development & Excellence*, *2*, 3–15.

Israel, G. D., Beaulieu, L. J., & Hartless, G. (2001). The Influence of Family and Community Social Capital on Educational Achievement. *Rural sociology*, *66*(1), 43-68.

Kim, D. H., & Schneider, B. (2005). Social capital in action: Alignment of parental support in adolescents' transition to postsecondary education. *Social Forces*, *84*(2), 1181-1206.

Krueger, A. B (2003). Economic considerations and class size. *Economic Journal, Vol. 113* (February), pp. F34–F63.

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.

Leopold, L., & Shavit, Y. (2011). Cultural capital does not travel well: Immigrants, natives and achievement in Israeli Schools. *European sociological review*, *29*(3), 450-463.

National Council for the Child. [Electronic version]. *Children in Israel-2013*. Retrieved from: http://www.children.org.il/index_eng.asp

Parcel, T. L., Dufur, M. J., & Cornell Zito, R. (2010). Capital at home and at school: A review and synthesis. *Journal of Marriage and Family*, *72*(4), 828-846.

Rosen, Y. (2009). Effects of animation learning environment on knowledge transfer and learning motivation. *Journal of Educational Computing Research, 40*(4), 439–455.

Rosen, Y., & Beck-Hill, D. (2012). Intertwining digital content and a one-to-one laptop environment in teaching and learning: Lessons from the time to know program. *Journal of Research on Technology in Education*, *44*(3), 225-241.

Rosen, Y., & Salomon, G. (2007). The differential learning achievements of constructivist technology-intensive learning environments as compared with traditional ones: A meta analysis. *Journal of Educational Computing Research, 36*(1), 1–14.

Schweizer, K., & Moosbrugger, H. (2004). Attention and working memory as predictors of intelligence. *Intelligence*, *32(4)*, 329–347.

Schweizer, K., Zimmermann, P., & Koch, W. (2000). Sustained attention, intelligence and the crucial role of perceptual processes. *Learning and Individual Differences*, *12*(3), 271–286.

Shephard, R.J. (1997). Curricular physical activity and academic performance. Pediatric Exercise Science, *9*, 113-126.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of educational research*, *75*(3), 417-453.

Steele, J., James, J. B., & Barnett, R. C. (2002). Learning in a man's world: Examining the perceptions of undergraduate women in male-dominated academic areas. *Psychology of Women Quarterly*, *26*, 46-50.

Tomporowski, P. D., Davis, C. L., Patricia, H. M., & Naglieri, J. A. (2008). Exercise and children's intelligence, cognition and academic achievement. *Educational Psychology Review, 20*(2), 111-131.

Vicente, K.J., & Wang, J.H. (1998). An ecological theory of expertise effects in memory recall. *Psychological Review*, *105*, 33–57.

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

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., Stoeger, H., & Grassinger, R. (2011). Actiotope model and self-regulated learning. *Psychological Test and Assessment Modeling*, *53*, 161-179.

Ziegler, A., Stoeger, H., & Grassinger, R. (2011). Actiotope model and self-regulated learning. *Psychological Test and Assessment Modeling, 53*(1), 161-179.

Ziegler, A., Stoeger, H., Balestrini, D. P., Phillipson, S. N., & Phillipson, S. (2014). Systemic gifted education. In F. A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education*. Austin, TX: Profrock.

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

Zohar, A. (1990). *Mathematical reasoning ability: its structure, and some aspects of its genetic transmission*. Unpublished Doctoral Dissertation, Hebrew University, Jerusalem.