Validation of the Educational and Learning Capital Questionnaire (QELC) on the Mexican population

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Abstract:
The Actiotope Model of giftedness is a systemic model with a focus on actions directed towards objectives of ability development. As such, the development of talents and extraordinary achievements is considered an intelligent adaptation to environmental and personal stimuli. The Questionnaire of Educational and Learning Capital (QELC) may allow for empirical evidence of successful adaptation of an actiotope. Thus, the purpose of this study was to examine the psychometric properties of The Questionnaire of Educational and Learning Capital in the Mexican population. A total of 374 gifted Mexican elementary school students participated ($\bar{X}$=11.18 age, S.D. 1.36). We calculated its internal consistency and performed confirmatory factor analysis. The results show that the original factor structure presents absolute fit, and low levels of error. Additionally, we observed adequate values of extracted variance (0.5<AVE) and composite reliability (0.7 < CRI) on all factors except for the economic subscale.

Keywords:
high capacities, student body, QELC, validity, CFA

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The Mexican education system is considered one of the largest in the world. It is composed of preschool, elementary school and middle school. In its three levels, preschool education focuses on children three to five years old, elementary education incorporates children six to twelve years old and consists of six grades, and middle school education teaches three grades to young men and women 13 to 15 years of age. Of the total student body that attends basic education levels (elementary and middle school), it is estimated that ten percent of the students have high capacities. Despite the fact that attention towards these students has been proposed, it has not been carried out in all of the schools in the country and many students frequently go unnoticed by the usual identification processes (Secretary of Public Education [SEP], 2006, 2017, 2019).

Although there is an intervention proposal, Educational Attention for Students with Outstanding Capacities by the Secretary of Public Education of Mexico and there is a clearly stated processes for identification and intervention, it is important to have other instruments that allow for the consideration of the personal and social factors associated with an individual. After all, it is very important that education for the students with the greatest capacities reaches the entire student body.

Students that are identified as possessing high capacities have academic, social and emotional experiences that are related to their individual resources and their environment. This generates great challenges in different dimensions (García-Barrera & de la Flor, 2016). The problems that the twenty-first century society needs to solve regarding people with high capacities and talents go beyond the intellectual coefficient or cognitive capacity. A way to approach how we should identify these individuals is by asking what challenges the world encounters at a given point in time. In other words, to really understand the performance of people with high capacities, it is necessary to understand the resources that can be used according to the demands presented by their surroundings (Covarrubias, 2018; Sternberg, 2017).

Ritchotte (2013) states that for decades researchers have studied high capacities in an effort too help gifted students reach their maximum capacity and prevent potentially devastating consequences such as school desertion. Thus, it is important to have models that explain and identify individuals with high capacities that allows for the comprehension of their resources and favors efficient attention for this population.

Nowadays there is a diversity of concepts and explicative models (performance-based models, sociocultural orientation models, cognitive models, and capability-based models). Each one studies a series of specific characteristics, which makes identification confusing and ambiguous. None of these explicative models of high capacities is able to encompass, with all of its interactions, a definition, study method and an education proposal that corresponds to all of the realities of society (Ziegler, Vialle, & Wimmer, 2013).

In the last decade different researchers such as Renzulli, Gagné, Tannenbaum, Mönks and Gardner have contributed to the understanding of gifted individuals through the expansion of both the individual and social fields of action. This is the case of the

actiotope model of giftedness, which aids in the identification of the resources that are partially found in the student (endogenous resources) and outside of the student (exogenous resources). This is a systemic model, which means that all of its elements interact (Ziegler & Stoeger, 2017). Actions are directed towards the development of abilities. As such the development of talent and extraordinary achievements is considered an intelligent adaptation to environmental stimuli (Vladut, Vialle, & Ziegler, 2015; Ziegler et al., 2013).

The actiotope model of giftedness focuses on the actions of an individual and its evolution. The development of excellence is understood as a dynamic system adaptation that intensifies in complexity through the interactions with the objective structure of a dominion. Thus, with increasing excellence, the individual will also achieve greater changes in the objective structure of self-dominion. The model takes into account the co-adaptation and co-evolution of the components of the Actiotope such as the range of actions and determinants, goals, subjective space of action and environment and the interpretation of these components within a network. These are gifts and talents that are traditionally understood as attributes of an individual (Ziegler, 2005).

Ziegler and colleagues (Ziegler & Baker, 2013; Ziegler, Chandler, Vialle, & Stoeger, 2017; Ziegler, Debatin, & Stoeger, 2019) suggest that the regulation of endogenous resources is subjected exclusively to the subsystem of the "person". However, even though exogenous resources may be used by the person, its supply generally depends on other systems (i.e. school, teachers, piers, educational system). They associate exogenous resources with the term educational capital, and the term endogenous resources with learning capital.

To offer empirical evidence for the model, we administered a low-cost instrument that measures two general factors: Educational Capital and Learning. Each factor contains five subscales (i.e. educational capital: economic, cultural, social, infrastructure and didactic; learning capital: organic, actional, telic, episodic and attentional). This instrument is called The Questionnaire of Educational and Learning Capital (QELC) developed by Vladut, Liu, Leana-Taşcilar, Vialle, and Ziegler, (2013) and adapted by Leana-Taşcılar (2016) for teachers. First studies demonstrated satisfactory psychometric qualities across different cultures, demonstrating content and construct validity (Vladut et al., 2013; Leana-Taşcılar, 2016).

Furthermore, Vladut, et al. (2015) adapted the QELC for elementary and middle school students. The results show that the reliability of the ten QELC subscales had a satisfactory range. However, reliability was low for the subscale that measures actional learning capital (α = 0.62) and telic learning capital (α = 0.68). The CFA model fits to the data when the five forms of educational capacity are influenced by a latent variable and the remaining five forms of learning capacity are influenced by a second latent variable.

In Israel, Paz-Baruch (2015) evaluated the validity of the QELC with a sample of 187 elementary school students from Israel to examine if the educational and learning capital of the students was related to intelligence and academic achievement. The study found correlations between infrastructure, didactic, organic, actional, episodic and attentional capacity. No correlation was found between general intelli-

gence and other QELC subscales. The internal consistency results and bifactorial CFA model confirmed the validity and reliability of learning and educational capital using the Hebrew version of the QELC.

Based on the validity and confidence results obtained by the above-mentioned studies, this research has the objective of understanding the psychometric properties of The Questionnaire of Educational and Learning Capacities to validate its use on the Mexican population.

Method

Participants

A convenience sampling was chosen, due to the availability for the application of the instrument, this ex post facto study recruited Mexican students from seven primary schools in the city of Guadalajara (n = 374), of which 102 students belong to the public sector and 272 students to the private sector. The age of the participants was $\bar{X}$ = 11.18 (S.D. 1.36); 50.5% of the participants (n = 189) were women and 49.5% were men (n = 189) (table 1).

Instrument

The Questionnaire of Educational and Learning Capital (QELC) (Vladut et al., 2013) is a 50 item-long self-report (e.g. I know from experience how to learn better), which is answered with a 6-point Likert-type scale, ranging from 1 = "Strongly disagree" to 6 = "Strongly agree". The 50 items are grouped into 10 subscales divided into two factors: Educational (Economic [1, 11, 21, 31, 41], Cultural [2, 12, 22, 32, 42], Social [3, 13, 23, 33, 43], Infrastructure [4, 14, 24, 34, 44], and Didactic [5, 15, 25, 35, 45]) and Learning (Organic [6, 16, 26, 36, 46], Actional [7, 17, 27, 37, 47], Telic [8, 18, 28, 38, 48], Episodic [9, 19, 29, 39, 49] and Attentional [10, 20, 30, 40, 50]). The QELC has demonstrated construct validity as well as acceptable internal consistencies (α = .57 <.86) in Germany, Turkey, Israel and China (Paz-Baruch, 2015; Vladut et al., 2013), yet the QELC's psychometric properties have not yet been examined in Spanish-speaking countries.

Table 1. *Characteristics of the participants*

Characteristics	*n*	%
Sex		
Female	185	49.5%
Male	189	50.5%
Grade		
4th grade	50	13.4%
5th grade	106	28.3%
6th grade	87	23.3%
1st middle school	97	25.9%
2nd middle school	16	4.3%
3th middle school	18	4.8%

Analysis

To identify whether the QELC is a valid instrument for Mexican samples, a Confirmatory Factor Analysis (CFA) was carried out.

To adapt the QELC from German to Spanish, we used the guidelines proposed by Beaton et al., (2000) for the translation and semantic equivalence of the items. The adaptation is composed by four phases: translation to Spanish, correspondence analysis, cultural adaptation and empirical adaptation.

Prior to the CFA, frequency distributions of the items and subscales were reviewed to assess their normality. Similarly, internal consistency analyses were carried out using the subscales reported by the authors. Complementary to analyzing the factorial solution of Vladut et al., (2013), we present the analysis when constraining to a single factor instead of two, as well as using the 10 subscales as first-order factors and the Educational and Learning scales as second-order factors.

Given the absence of negative multivariate kurtosis and approximate multivariate normality, the CFA were carried out using the default Maximum Likelihood estimator and fit was assessed using the following indices: For absolute fit we used the χ^2 statistic, where a non-significant discrepancy value is expected; for close fit we used CFI, TLI and GFI, where values above 0.9 indicate good fit and values above 0.95 indicate excellent fit (Abad et al., 2011; Hair et al., 1999). To evaluate acceptable error values, we used the SRMR and the RMSEA; SRMR values < 0.10 are considered acceptable, whereas for RMSEA values < 0.08 indicate an acceptable fit, and values < 0.05 indicate very good fit. To quantify fit discrepancy between models, we used the AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) as comparative criteria, where smaller values indicate better fit (see table 2) (Browner & Crudeck, 1993; Byrne, 2001; Littlewood & Bernal, 2011; Moral, 2006). Additionally, the Average Variance Extracted (AVE) and the Composite Reliability Index (CRI) were calculated. Values of AVE > 0.5 indicate an adequate percentage of explained variance and, values of CRI > 0.7 are sufficient (Hair et al., & Black, 1999). Preliminary analyses were carried out in SPSS V.25 and the CFA was performed in AMOS V.24.

RESULTS

Analysis of normality and internal consistency

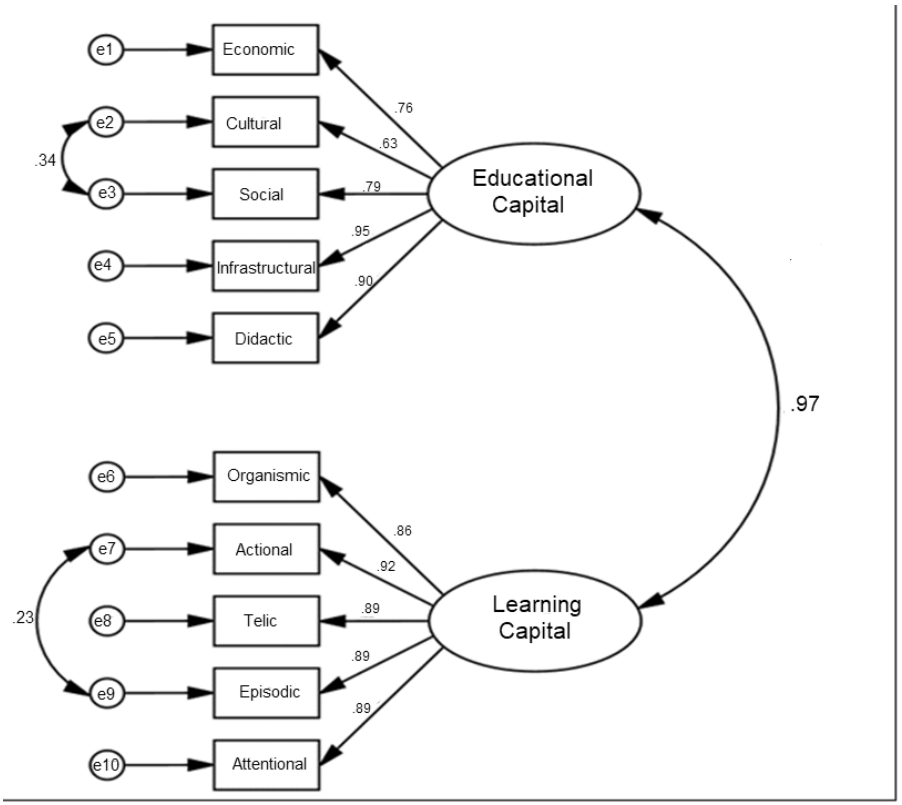
Although only seven items presented non-significant Shapiro-Wilk values, none of the items or subscales presented asymmetry or kurtosis values greater than the cut-off points (|2| and |6| respectively), which suggests approximately normal distributions. With the exception of "Economic", the subscales showed moderate to high internal consistencies (α=0.79 < 0.86) and the consistencies of the factors were excellent: Educational (α = 0.94) and Learning (α = 0.96). Item 31 (i.e. "I think my education is very expensive") had a low total correlation with the rest of the items in the "Economic" subscale (r = 0.21), which threatened internal consistency. By eliminating this item, the internal consistency reached acceptable levels (α = 0.59 to α = 0.64). Subsequent analyses were run including and excluding item 31 as a sensitivity analysis, yet fit indices, determination coefficients and internal consistency always favored the exclusion of this item from the analyses.

Confirmatory Factor Analysis

The CFA was carried out using the factorial solution reported by Vladut et al., (2013), where five subscales correspond to each of the two factors (Educational and Learning). We complementarily ran an analysis constraining all subscales to one factor, and another model with second order factors where each subscale is estimated as first order latent factors.

The original model by Vladut et al., (2013) demonstrates close fit as well as moderate levels of error (see Table 2: Model 1). Modification indices do not suggest cross-loadings, all factorial loadings are significant, latent variables present significant variances and the variances explained for the subscales are high ($R^2 = 0.41 < 0.89$) (see figure 1). Given the high correlation between both factors, another analysis was run linking the 10 subscales to a single factor but the chi-squared fit index demonstrated a sig-

Figure 1. *Questionnaire of Educational and Learning Capital (QELC) (Vladut et al., 2013). Model 4: Original factorial solution with two Modification Indices.*



Source: Original work based on AMOS output

nificantly worse fit when compared to the first model $\Delta\chi$ (1) = 31.62 p <.000, ruling out this alternative (see Table 2: Model 2).

To improve the fit of the original model, the analysis was rerun adding the Lagrange multiplier with the largest coefficient (covariance between the errors of the Cultural and Social subscales of the Educational factor) and subsequently with the modification index presenting the greatest magnitude for the other factor (covariance between the errors of the Episodic and Actional subscales, now from the Learning factor). Both additions significantly improved absolute fit ($\Delta\chi(1) > 3.84$ in both cases), increased close fit and decreased residual errors with respect to the previous model (Higher CFI, TLI, and GFI, lower SRMR, RMSEA as well as AIC and BIC). Our fourth model presented excellent close fit, as well as acceptable levels of error (see Table 2: Model 4). Although it does not present absolute fit, the discrepancy is probably due to the absence of strictly normal data. Despite our approximately normal univariate distributions, small fluctuations in bias and kurtosis would violate the assumption of multivariate normality posed by the Maximum Likelihood estimator, which represents an obstacle in approaching absolute fit (Curran et al., 1996).

Complementarily, each subscale was independently analyzed as a first order factor to later be combined and thus validate the instrument with first and second order factors. To avoid an overfitting of the sample, only two Lagrange multipliers were allowed per subscale. The fit indices for these analyses are presented in Table 3.

All first-order factors presented absolute fit and low levels of error. Additionally, adequate values of variance extracted (0.5 <AVE) as well as composite reliabilities (0.7 <CRI) were observed in all the factors, except the Economic factor (even without item 31). When estimating the second-order factor "Educational", only the Cultural, Social and Didactic sub-factors were formed. In contrast, Economic and Infrastructure are presented as Heywood cases (Byrne, 2001) (i.e. Negative variances and factor loadings greater than one). In a base model with only the 5 first-order factors, the correlations between factors were unexpectedly high (r =

Table 2. *Fit indices from the Confirmatory Factor Analyses*

Model	χ^2	*gl*	*p*	CFI	TLI	GFI	SRMR	RMSEA	AIC	BIC
Model 1: QELC	138.5	34	.0001	.97	.96	.92	.02	.091*** [.075- .11]	180.6	263.09
Model 2: QELC single factor	170.2	35	.0001	.96	.95	.91	.03	.102*** [.09- .12]	210.7	289.27
Model 3: Model 1 with one M.I.	95.3	33	.0001	.98	.97	.95	.02	.071* [.055- .088]	140.7	249.05
Model 4: Model 1 with two M.I.	83.5	32	.0001	.98	.98	.96	.02	.066 [.049- .083]	131.5	221.83

Note: *M.I.= Modification Index.*

Table 3 *Fit indices for first-order factors*

Factor	χ^2	*gl*	*p*	*CFI*	*TLI*	*GFI*	*SRMR*	*RMSEA*	*AVE*	*CRI*
Educational Capital										
Economic	2.01	2	.365	1.00	1.00	.99	.01	.004 [.000- .103]	.37	.67
Cultural	5.30	3	.151	.99	.98	.99	.01	.045 [.000- .107]	.51	.77
Social	6.45	3	.091	.99	.98	.99	.01	.056 [.000- .115]	.65	.84
Infraestructure	5.46	5	.362	.99	.99	.99	.01	.016 [.000- .075]	.68	.85
Didactic	1.56	5	.906	1.00	1.00	.99	.00	.000 [.000- .029]	.68	.85
Learning Capital										
Organic	5.50	5	.357	.99	.99	.99	.01	.000 [.000- .029]	.67	.85
Actional	1.72	3	.632	1.00	1.00	.99	.00	.000 [.000- .070]	.62	.83
Telic	5.36	3	.147	.99	.98	.99	.01	.046 [.000- .108]	.61	.82
Episodic	2.85	4	.582	1.00	1.00	.99	.01	.000 [.000- .067]	.68	.85
Atttentional	4.40	3	.221	.99	.99	.99	.01	.000 [.000- .029]	.56	.80

Note: AVE=Average Variance

0.65 < 0.97 vs. r = 0.55<.83 when they were sumscales) and even aberrant for the pairs Infrastructure with Didactics (r = 1,001) and Economic with Infrastructure (r = 1,006), which suggests multicollinearity and a poor specification of the model where each of the 10 indicators are treated as a first-order factor. The second order factor "Learning" presented the same problem since the Actional and Attentional factors were also presented as Heywood cases. In the base model, correlations between factors were still higher than for the previous factor (r = 0.86<.99 vs. r = 0.73 < 0.86 when they were sumscales), and the correlation between the Actional and Episodic pair was aberrant (r=1.003), also suggesting multicollinearity and a poor specification of the model if the subscales are taken as first order factors. In this sense, the original factorial solution reported by Vladut et al. (2013) presented construct validity in this Mexican sample, as well as moderate and high levels of internal consistency.

Discussion

Nowadays, nations strive to provide some of the development standards to produce scientists in different fields. Thus, these countries attempt to discover gifted children and present them with adequate attention to help them to be creative in the future (Olimat, 2010)

In Mexico, the identification of children with high capacities and the attention given to them has had important developments. However, the actions employed in this country and other parts of the world are

still insufficient. Efforts are isolated, and previously generated resources and experiences are underutilized (Valadez, 2019). In Mexico the identification and evaluation of these students is frequently expensive due to parents, professors and specialists implementing different resources. Identification is through exploratory activities by teachers and through products of the children's aptitudes. Meanwhile evaluation is a series of standardized psycho-pedagogical tests that include the application of intelligence tests, creativity and socialization.

As was mentioned earlier, there are various models of explanation and giftedness and talent. However, none of them are capable of encompassing, with all of its interactions, a definition, a study method and an educational proposal, that matches all of the realities of society (Ziegler et al., 2013).

However, the Actiotope Model of Giftedness is a systemic model with a focus on directed actions towards objectives concerning the development of abilities. As such, the development of talents and extraordinary achievements is considered an intelligent adaptation to environmental stimuli (Vladut et al., 2015).

Instead of identifying individuals through classic cognitive methods (tests of intelligence coefficients), it analyzes the route of entry that learning and excellence will have (Leana-Taşcılar, 2016). These resources are partially found in the student (endogenous resources) and partly found outside of the student (exogenous resources).

Ziegler et al. (2017) suggest that the regulation of endogenous resources is subject exclusively to the "person" and that the person can use exogenous resources. Their provision generally depends on other systems. Thus, they associated the term of learning capital with endogenous resources. Based on this model, Vladut et al. (2013) developed a questionnaire that is a quantitative economic measurement instrument that allows for large-scale surveys on students. The resulting instrument, the QELC, includes only 50 items grouped into 10 subscales (five for educational capital and five for learning capital), and was designed as transculturally applicable product (Leana-Taşcılar, 2016).

The objective of this study was to understand the psychometric properties of the QELC instrument to validate the theoretical assumptions of the Actiotope Model of Giftedness in the Mexican population. However, this study was not without limitations. The sample was collected from seven schools in Guadalajara through non-probabilistic methods meaning our results should be interpreted in light of these conditions and its generalizations should be done with caution.

Once the items were adapted from the original scale through the direct translation method, we modified the items in the economic subscale from the education capital with the help of the authors of the questionnaire. The changes were requested because the perception of insecurity in Mexico regarding violence is a public problem that makes the people's quality of life more vulnerable. In Mexico, more than half (66.1 %) of the populations feels insecure in the state in where they live. This has stopped people from doing everyday activities, which has repercussions on social recreation and relaxation, and inhibits social cohesion, even generating fear when providing information on personal economy (Jasso, 2013).

Afterwards we revised the psychometric properties of the instrument through confirmatory factor analysis. We found evidence for satisfactory psychometric prop-

erties, which confirms the construct validity of the QELCS's original factorial solution proposed by Vladut et al., (2013) in Mexico. However, we observed difficulties regarding the Economic factor, particularly with the adjustment of item 31.

We tested three distinct factorial solutions: 1) the original model proposed by the authors, 2) A single latent factor model, and 3) an exploratory model devised from using the 10 sumscales as first-order latent factors which belong to two second-order factors. Our results support the original model with two covarying first-order factors and ten sumscales based on 49 items (not the original 50, as we eliminated item 31 due to reliability purposes). By eliminating item 31 (i.e., "I think that my education is very expensive") we obtained better psychometric propertied. This is because the subfactor "Economic" of educational capital is strongly related to exogenous resources and closely linked to the violent conditions of Mexico such as kidnapping, theft and organized crime. However, all in all the QELC demonstrates satisfactory psychometric qualities in the Mexican context and provides a valid representation of the existing relationships between the variables that make up the educational and learning capitals for high-capacity elementary school students in Guadalajara, Mexico.

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