Teaching for Successful Intelligence Questionnaire (TSI-Q) – a new instrument developed for assessing teaching style

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Abstract

The aim of the present study was to develop and validate a questionnaire for assessing teaching styles described in the theory of teaching for successful intelligence. The new instrument allows the identification of the teachers' preferences for teaching styles relevant to stimulating the students' creative, analytical, practical and reproductive abilities. The sample included 362 teachers from Romanian high schools and universities. The results obtained indicate that the scales of the questionnaire have a good internal consistency. We investigated the validity of the scale by analysing associations with thinking styles and the Big Five model traits. Results confirm the validity of the questionnaire. The new questionnaire can be used in the analysis of strengths and weaknesses of teaching activity as well as in teacher training.

Keywords: successful intelligence; teaching for successful intelligence; scale development.

1. Introduction

In the theory of successful intelligence, Sternberg (1999, 2003a) suggested that the objectives of formal education regarding information assimilation should be formulated with objectives related to the development of students' creative, analytical and practical abilities. This means that educators must use teaching styles that are different from those based on information retention and reproduction: sometimes they must encourage students to analyze, to evaluate critically and to compare; other times, they must stimulate them to create, discover, imagine or produce hypotheses; and yet other times – to apply, to put into practice what they have learned (Sternberg, 2008a). Educators do not need to individualize the teaching process for each student, but only to use teaching styles that allow the stimulation of the students' analytical, creative and practical abilities, giving them the possibility to capitalize on their strengths as well as to compensate for and remedy weaknesses (Sternberg, 1998). As a consequence, it is equally essential that teachers are aware of their teaching style, as well as knowing the alternatives for diversifying their teaching methods (Sternberg, 2008a).

Previous researches have focused on validating the theory of successful intelligence by means of experimental studies related to students' learning, but very little research has been aimed at assessing teaching styles relevant to successful intelligence (Sternberg, Grigorenko, Ferrari and Clinkenbeard, 1999; Sternberg, 2003a; Sternberg and Grigorenko, 2004). This current paper presents the development and validation of a questionnaire for self-assessment of one's teaching style relevant to the development of successful intelligence. The results obtained after applying the questionnaire, provide information regarding both one's own teaching style, as well as giving direction for future development, and can be used in teacher counseling – for

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enriching and diversifying teaching methods, as well as in planning intervention programs in educational establishments.

2. Theory of Successful Intelligence

Sternberg (2003a) suggested that one should focus more on *"successful intelligence"*, instead of focusing on the classical notion of intelligence. Successful intelligence was defined as *"the ability to achieve success in life in terms of one's personal standards, within one's socio-cultural context"* (Sternberg, 1999, p. 296; Sternberg, 2003a, p. 141). From this perspective, being successfully intelligent means having the ability to adapt, to shape and to select environments/contexts that offer the possibility to achieve one's personal, social and cultural goals (Sternberg, 2008a, 2008b). In order to use these abilities, one must have the capacity and insight to identify one's own strengths and weaknesses and to find ways to harness them, compensate for them or correct them where needed (Sternberg and Kaufman, 1998; Sternberg, 1999, 2004b).

Successful intelligence implies finding balance in using analytical, creative and practical abilities (Sternberg and Grigorenko, 2004; Sternberg, 2008b). *Analytical abilities* are used in analyses, comparisons and evaluations, as they are required in solving and decision-making processes (Sternberg, 1988; Tigner and Tigner, 2000; Sternberg, 2008b). *Practical abilities* allow generalizations of knowledge obtained by the subject in different contexts – i.e., applying procedural knowledge in everyday tasks (Sternberg, 2008b). *Creative abilities* are necessary when facing situations that possess a certain degree of novelty (Sternberg, 2008b; Stemler, Sternberg, Grigorenko, Jarvin and Sharpes, 2009), as well as when having to cope with recurring circumstances. On the one hand, new situations require skills that can be remotely based on previous experience and, on the other hand, recurring circumstances benefit from automation that frees up attention for use elsewhere (Tigner and Tigner, 2000, p. 174; Sternberg, 2003b, 2004a, 2008a).

Research studies on the influences of instructional conditions (which emphasized either memory, analytical, creative or practical instruction), have highlighted the fact that school (a) favours children with analytical and memorising abilities and (b) consistently shows little support for creative or practical abilities (Sternberg, Grigorenko, Ferrari and Clinkenbearrd, 1996; Sternberg, 2008a). Students taught in accordance with their thinking style obtained much better performances because teaching for successful intelligence allows students to capitalize on their strengths, correct or compensate for their weaknesses, and assimilate the material in various ways (Sternberg, 1988, 1999).

3. Teaching for Successful Intelligence

Teaching for successful intelligence implies creating a balance between four teaching styles: a traditional teaching style (focused on retention of information), a teaching style which encourages analytical abilities, one which encourages creative abilities and one which encourages practical abilities (Sternberg and Grigorenko, 2004; Sternberg, Lipka, Newman, Wildfeuer and Grigorenko, 2006; Sternberg, 2008b)**.**

Traditional teaching aims at forming and developing a knowledge base, focusing on students' memorizing and analytical skills. However, approaching teaching from the perspective of successful intelligence the aim is to extend this basis, developing a person's expertise by (a) harnessing their creative and practical abilities, along with

the analytical and memorizing ones, allowing them to harness their intellectual qualities; and (b) by offering multiple ways of assimilating information (by means of analytical, creative and practical activities), thus enabling retention of the study material (Sternberg, 2002, 2003a). From this perspective, the teacher's role is not only to provide information for students to assimilate and then reproduce in the process of evaluation, but also to stimulate students in generating and assessing ideas, and in the effort to make these ideas work in practice, at the same time convincing others of their value (Sternberg, 2002, 2003a). According to Sternberg, Torff and Grigorenko (1998a, 1998b) and Sternberg and Grigorenko (2004), the students who experienced teaching styles stimulating the four types of abilities (reproductive, analytical, creative and practical) obtained better results at the end of the year, as compared to students who experienced traditional teaching (Sternberg, 2008a).

Sternberg (2002) describes at length four types of teaching which result from catering for the four types of abilities. Teaching in a manner that stimulates the students' *reproductive abilities* represents a foundation without which achieving the other types of teaching would not be possible because: (a) people cannot think in a critical manner about what they know if they do not hold that basic knowledge; (b) people cannot explore ideas and find new solutions if they do not know what already exists, and (c) people cannot apply in practice and find a use for their knowledge if they do not possess it. Teaching based on memorizing implies stimulating and evaluating one's memory (a) by asking students to reproduce and update certain information, (b) by recognizing what has already been learned, (c) by verifying information, and (d) by answering questions such as who, what, when, how, why. Teaching in a way that leads to *the development of students' analytical abilities* implies encouraging them (a) to analyze the information provided, (b) to explain the way things happen or function, (c) to draw comparisons between situations or problems, estimate the value of information, analyze alternatives, and (d) "to break up the whole into pieces". When one aims at *stimulating creative abilities*, the focus of the teaching activity is placed on (a) enabling learning using word or role-playing games, (b) inventing and exploring new ways to solve various situations or problems, (c) imagining scenarios where one may use the acquired knowledge or find new uses for it, (d) doing things differently from the majority, sometimes even "defying" the logic of things. All information assimilated in class gains weight when it is contextualized in practical activities. In *teaching for stimulating practical abilities* students must be encouraged (a) to apply in their everyday activity the information received in class, (b) to verify theoretical strategies, (c) to experience practically what they know in theory. The teacher can use practical situations as a starting or closing point, and can give students the possibility to control abstract concepts (Sternberg and Williams, 1997; Sternberg, Torff and Grigorenko, 1998a; Sternberg, 2002, 2003a).

4. Variables associated with teaching style

4.1. Thinking style

During the teaching activity, stimulating different abilities imply using different mental operations and abilities. According to the theory of mental self-government (Sternberg, 1994), the preference for certain mental operations and abilities is a personal variable, called *thinking style*. The central idea of this theory is the need manifested by people for "governing" or controlling how everyday activities are carried out (Zhang, 2001a; Zhang and Sternberg, 2005, 2006). There are different possible ways to carry out these activities, but each person defines and perpetuates

his/her own style, the one which provides him with the highest level of psychological comfort. These styles are changeable over time and depend on the requirements of the environment that the individual is faced with. A salient feature is that thinking styles are partially socialized – i.e., they can be cultivated and modified (Zhang, 2001a; Zhang and Sternberg, 2005, 2006). This is significant because it indicates the possibility of change if the current thinking style is proven ineffective.

The theory of mental self-government describes 13 thinking styles grouped according to five criteria. One can speak of the three functions of the state (which lead to three thinking styles: legislative, executive and judicial), four forms of organisation (which lead to four thinking styles: hierarchic, oligarchic, monarchic and anarchic), two levels of exercising power (which lead to two thinking styles: global and local), two scopes which lead to two thinking styles: internal and external) and two political orientations (which lead to two thinking styles: conservative and liberal) (Sternberg and Wagner, 1992; Zhang and Huang, 2001; Zhang and Sternberg, 2005). This theory is relevant because styles are not seen as "good" or "bad", but only as a preference to use abilities in the interaction with the task being carried out by the individual (Zhang, 2001a; Zhang and Huang, 2001; Zhang and Sternberg, 2006).

Zhang (2001b) noticed several relationships between teaching approach and thinking styles within the teaching activity. Teachers who adopted a teaching method centred on students' conceptual change mainly used legislative, judicial, global and liberal thinking styles. Teaching centred on students' conceptual change implies creating an atmosphere which allows assessment, decision making, the development of intellectual autonomy, leading to a global perspective on the problems encountered during learning tasks. If teaching is centred on conveying information, then the executive, local and conservative thinking styles are used most often. Within this type of teaching, the focus is on providing facts and information, which students must later recall and reproduce (Zhang, 2001b).

Regarding the relationships between thinking styles and teaching styles for successful intelligence, Zhang (2007) investigated these associations using a single-item measure for assessing teachers' self-perception regarding their analytical, creative and practical abilities. In her study, Zhang (2007) reports significant correlations between self-reported analytical abilities and legislative, global and liberal thinking styles; between self-reported creative abilities and legislative and liberal thinking styles; and between self-reported practical abilities and legislative, executive and global thinking styles (Zhang, 2007, p. 832). Starting from these results and the content of each teaching style relevant to successful intelligence, in Table 1 we present several hypothesized correspondences between thinking and teaching styles (Sternberg, 1999, 2002, 2003a, 2006; Zhang, 2001b, 2002).

Table 1. The correspondence between teaching and thinking styles

Teaching styles	Characteristics	Thinking style
Stimulating reproductive abilities	Recognizing and reproducing/updating information; Verifying information (who, what, how, when);	Conservative (the traditional way of doing things); Monarchic (focusing on a single task);
Stimulating analytical abilities	Analysing the information provided; Assessing what is being learned; Assessing Explaining the way things work; Comparing more situations or	Judicial (working on tasks that imply novelty and ambiguity); Judicial (working on tasks that imply novelty and ambiguity); Judicial (working on tasks that imply

	problems; analysing the alternatives; Breaking up the whole into pieces;	novelty and ambiguity); Hierarchical (approaching multiple and prioritized tasks);
Stimulating creative abilities	Inventing and exploring new ways to solve various situations or problems;	Legislative (working on tasks that imply creative strategies);
	Doing things differently from the majority;	Progressive (using new ways to solve tasks);
Stimulating practical abilities	Applying in everyday activities the information received in class; Verifying theoretical strategies;	Executive (working on tasks with clear structure and instructions); Legislative (working on tasks that imply creative strategies);
	Experiencing in practice what is known in theory;	Local (focusing on concrete ideas);

4.2. Personality – The Big Five (Five Factor) Model

The relationships between personality and various specific learning and teaching styles have been explored frequently in research studies on education settings (Zhang and Huang, 2001), but the correlation between personality and preferences for different teaching styles remains unexplored (Chamorro-Premuzic, Furnham and Lewis, 2007).

The Big Five model is acknowledged as a descriptive taxonomy of normal personality factors. The five essential dimensions of human personality – neuroticism, extraversion, openness to experience, agreeableness and conscientiousness – exert a strong influence on behaviour (Costa and McCrae, 1992; Komarraju and Karau, 2005). People with high levels of *neuroticism* (or low emotional stability) experience feelings of guilt, uneasiness, pessimism and low self-esteem. Those with high scores on the *extraversion* scale are assertive, sociable and teamwork-oriented people. *Openness to Experience* is characterized by attributes such as rich imagination, preference for variety, independence in thought. High scores on *agreeableness* characterize altruistic people, who value and respect conventions and other people's convictions. Individuals with high scores on *conscientiousness* are strong-willed, responsible and trustworthy (Costa and McCrae, 1992; Zhang, 2001a; Zhang, 2004).

Regarding relationships between the successful intelligence theory and the Big Five model, previous research showed that high scores on Openness and Emotional Stability are associated with high performance in creative tasks (Macsinga, Maricuţoiu and Paloş, 2010). Consequently, correlations would also be expected between adopting a teaching style that stimulates students' creative abilities and both Openness and Neuroticism (or low Emotional stability). In addition, previous research found that conscientious students perform better in memory and analytical tasks (Macsinga et al, 2010). Therefore, we would expect a positive correlation between conscientiousness and the use of a teaching style which stimulates students' analytical abilities.

4.3. Demographic variables

Features such as age, gender, teaching experience or type of subjects taught could be associated with adopting a particular teaching style. Therefore, the investigation of relationships between teaching styles for successful intelligence and demographic variables could provide valuable information for the validation of the criteria used in the present questionnaire.

Regarding gender, research indicated that men tend to focus on a general approach to solving problems, as opposed to women, who are more detail-oriented (Zhang and Sternberg, 2006). Based on this result, we expect female teachers to obtain higher scores than men for the teaching style which encourages practical abilities, based on details.

Research into the relationship between the age variable (and its correlate, length of teaching service) and teaching styles generated mixed results. On the one hand, there are studies highlighting the fact that the elderly tend to generate more creativity and show higher levels of cognitive complexity, explained by the fact that thinking tends to become more complex with age (Zhang and He, 2003; Zhang and Sternberg, 2006). On the other hand, other research studies (Cheung, 2002; Zhang, 2002b as cited in Zhang and Sternberg, 2006) have not confirmed these results.

The inconsistent results regarding the relationships between thinking styles and academic disciplines taught (Zhang and Sternberg, 2006) may be attributed to the specific cultural environments in which the teachers taught. Therefore, we cannot predict any relationship between the teaching styles and the disciplines taught.

5. Methodology

5.1. Objectives

The present study aims to achieve the following objectives:
O1. To develop a questionnaire for evaluating the teaching style, from the perspective of the theory of teaching for successful intelligence.
O2. To assess the validity of the Teaching for Successful Intelligence Questionnaire (TSI-Q).

5.2. Participants

362 participants, who teach in Romanian high schools (74.1%) and universities (25.9%), volunteered to take part in the study, and were recruited among teachers involved in various continuing professional training courses accredited by the Romanian Ministry of Education and Research, between 2006 and 2011. The questionnaires were distributed to the participants and were completed as part of the training. Therefore, this sample can be considered a convenience sample. The participants were: 31.7% male, 76.2% women, with a mean age of 39.46 years (SD = 10.21), and a mean of length of teaching service of 14.80 years (SD = 9.85). From the point of view of subject speciality, 68% of the participants teach humanities (languages, history, geography, etc.), while the others teach disciplines in the realistic field (mathematics, physics, chemistry, etc.). In the process of selecting participants, we used a minimum 5-year experience requirement, due to the fact that previous studies (Reed and Bergemann, 1992) have shown that by this point teachers have developed a preference for a particular teaching style.

5.3. Instrument

The instruments used in this research were the following:
The Teaching for a Successful Intelligence Questionnaire (TSI-Q) was developed within the present research. The TSI-Q is a self-report tool which measures the four teaching styles relevant to successful intelligence.
The Thinking Styles Inventory (the shorter version) is a tool developed by Sternberg and Wagner (1992). The scale is made up of 65 items and assesses the 13

thinking styles: legislative, executive, judicial, monarchic, hierarchic, oligarchic, anarchic, local, global, internal, external, conservative and progressive. It is a self-assessment questionnaire, where each subject answers questions according to the gradual agreement or disagreement with its content, on a 6-step Likert scale (1-strong disapproval – 6-strong approval). The 13 styles are distributed along five dimensions of mental self-government: functions, forms, levels, scope and orientation (Zhang, 2001a). Previous studies that have used this scale in Romanian culture (Macsinga, Paloş and Maricuţoiu, 2002) have shown that results were convergent with the model proposed by Sternberg. More recent research (Sava, 2008) replicated correlations between the Romanian adaptation of the Thinking Styles Inventory and the Big Five Factor, thus supporting its validity. On the present sample, internal consistencies of the 13 scales had values ranging from .53 (the monarchic thinking style) to .73 (the legislative thinking style). These values of internal consistency indices are similar to the findings reported by Macsinga et al. (2002) or by Sava (2008).

The DECAS Personality Inventory (Sava, 2008) has 95 items with that require dichotomous "true/false" answers. The items are distributed on 5 scales: openness, extraversion, conscientiousness, agreeableness and emotional stability. On a national representative sample, the internal consistency of the scales ranged from .70 (for conscientiousness) to .75 (for emotional stability) (Sava, 2008). The inventory also contains 3 scales for validating the answers (Sava, 2008): social desirability (high scores indicate the tendency to show a favourable image), random answers (high scores indicate the tendency to answer randomly, without reading the content of the items) and approval (high scores indicate the tendency to agree with the statements that make up the items, regardless of their content). Concurrent validity data indicated very good correlations with the Romanian version of NEO PI-R (Iliescu, 2007), with uncorrected correlation coefficients ranging from .57 for Agreeableness to .81 for Extraversion. Convergent findings supporting the five-factor structure of the DECAS Personality Inventory (e.g., RMSEA of .08) were gathered by Sava (2008) in a validation study that included concurrent instruments such as the Romanian adapted version of BFQ (Barbaranelli and Caprara, 2008) and Goldberg's IPIP items (Goldberg, 1992).

6. Results

6.1. Development of the TSI-Q

6.1.1. Item generation and pilot study

This questionnaire was developed starting from the definitions of the four teaching styles relevant to the theory of successful intelligence (Sternberg, 1999). We intended to develop a short questionnaire, with 4-6 items for each teaching style. Therefore, the initial version of the TSI-Q had eight items for each teaching style: memorising, analytical, creative and practical. TSI-Q items are statements formulated in the first person singular (for example, "When I teach…" or "In my teaching activity, I…") and describe teaching behaviours specific to the development of each ability. The respondents must indicate their degree of agreement or disagreement with each statement, on a 6-step Likert scale (1–very strong disapproval, 6-very strong approval). We opted for the Likert scale and not for dichotomous answers in order to obtain "degrees" of manifestation of the respective style (Thomas & McKay, 2010).

The first author formulated the items starting from characteristics of each type of ability, using the basic activities involved in the teaching-learning process, as described by Sternberg (2002). Thus, in order to highlight the activities that stimulate

the students' memorising abilities, we used verbs such as "to recall", "to recognize", "to verify", and "to repeat". For the analytical abilities, we used verbs such as "to analyse", "to evaluate", "to explain", and "to compare". For the creative abilities, we used verbs such as "to create", "to invent", "to explore", "to imagine", and "to presume". For the practical abilities, we used verbs such as "to put into practice", "to use", "to implement", "to apply".

The first version of the questionnaire was analyzed by a group of 15 university teachers who are familiar with the content of the theory of successful intelligence. These teachers provided suggestions for reformulating some items. After revising the items, the TSI-Q was completed by 362 university and school teachers.

6.1.2. Content validity of TSI-Q items

We conducted a content validity study on the TSI-Q items, using the recommendations provided by McGartland-Rubio, Berg-Weger, Tebb, Lee and Rauch (2003). All 32 items were evaluated by fourteen experts (9 with a Ph.D. in Psychology and 5 Ph.D. Psychology students). Experts received operational definitions for each teaching style, accompanied by a list of items for each scale. Using a 4-point Likert scale, each expert had to evaluate each item based on two criteria: representativeness of the content domain and clarity of expression. All 32 items obtained average evaluations above 3 on both criteria, which indicate that the TSI-Q has an acceptable content validity.

6.1.3. Investigation of TSI-Q factor structure and reliability

Following the specifications provided by Byrne (2010), we used structural equation modelling (SEM) to confirm the existence of four latent teaching styles. This confirmatory analysis allows for hypothesis-testing approach in data analysis (Byrne, 2010), and is superior to exploratory analyses because it provides a statistical test for assessing the appropriateness of the model. We used maximum likelihood estimation to assess model fit, and reported fit indices indicated by previous research (Fan, Thompson and Wang, 1999) as least influenced by estimation method (the Goodness-of-Fit Index – GFI, and the Adjusted Goodness-of-Fit Index – AGFI) or by sample size (the Comparative Fit Index – CFI and the Root-Mean-Square Error of Approximation – RMSEA). We also reported the χ^2 test of discrepancy, and we computed $\Delta\chi^2$ test for assessing the significance of the difference between two nested models.

In the first stage of analysis, we tested two alternative models using all 32 items: (a) a model that hypothesized the existence of four uncorrelated latent variables; and (b) a model that hypothesized the existence of four correlated latent variables. The results of this analysis (see Table 2) indicated that the model assuming the existence of four correlated teaching styles is significantly more adequate for describing the relationships between the 32 items ($\Delta\chi^2(3) = 679.29$, $p<.001$). However, the fit indices for the model assuming four correlated factors did not have values high enough to accept it as appropriate: we obtained values below .90 for CFI (.78) and the RMSEA had a value of .083, which is larger than the suggested cut-off value of .05.

Table 2. Fit indices for the alternate CFA models of the TSI-Q

Model	χ²	GFI/AGFI	RMSEA	CFI
			Value (Confidence interval)	
4 uncorrelated factors (32 items)	χ²(464)=2288,57; p<.001	.68/.63	.104 (.100-.109)	.66
4 correlated factors (32 items)	χ²(461)=1609.28; p<.001	.76/.73	.083 (.079-.088)	.78
Final model 4 correlated factors (20 Items)	χ²(352)=352,23; p<.001	.91/.89	.056 (.048-.064)	.94

In light of these results, we were interested in improving the model by identifying and eliminating items associated with to more than one latent factor. Therefore, we conducted several iterative, post-hoc analyses aimed at detecting misspecifications within the model with four correlated factors. We conducted the analyses using the *Modification indices* option provided by AMOS 4.0, and we focused on suggested regression weights that could improve the overall fit. Where we found that the model could be optimized by linking an item to a teaching style, we eliminated the item and re-estimated the model. Through this iterative, stepwise procedure, we eliminated 12 items that were associated with teaching styles other than the ones we had constructed. The final model has 20 items (5 for each teaching style) and fit indices above their critical values: RMSEA = .056 (critical value = .06), CFI = .94 (critical value = .90). The GFI (.91) and AGFI (.89) values also indicate acceptable fit (Table 3).

Table 3. List of items and factor loadings for the TSI-Q

Item	CA	RA	AA	PA
6. In my teaching activity, I valorise my students' imagination in solving problems (imagining situations, exploring new ideas, etc.).	.73			
9. In my teaching activity, I encourage my students to imagine different situations and then think what could happen if things were as they had imagined them to be.	.65			
19. By the way I teach, I stimulate my students to discover new ways of functioning, new principles or laws that can be applied in various situations.	.74			
4. By the way I structure my teaching, I stimulate my students' creative abilities.	.61			
3. In my teaching activity, I use games (word games, role-playing games etc.) to make learning easier.	.47			
11. By the way I structure my teaching, I stimulate my students' reproductive abilities.		.78		
17. In my teaching activity, I favour and value the use of memorising in the learning process.		.83		
1. In my teaching activity, I focus on creating situations where I can develop students' memorising ability.		.75		
8. I prefer a teaching style where I create situations for my students to reproduce/repeat the information accumulated in class activity.		.62		
14. In my teaching activity, I focus on my students gathering a large amount of information.		.66		
15. I prefer teaching situations where students can assess the typical value of various given information (various laws, models, methods, etc.).			.64	

12. In my teaching activity, I stimulate my students' critical thinking (assessing, testing solutions, choosing the most adequate, rejecting the less adequate, etc.).	.72
2. When I teach, I focus on my students' capacity to analyse the information provided (why something happens).	.53
18. In my teaching activity, I emphasize my students' capacity to explain the way certain processes unfold or certain things function (the way something happens).	.58
5. I prefer teaching situations where students are given the opportunity to compare and find differences between two or several suggested situations, problems, pieces of information.	.62

13. When teaching in class I focus on my students' practical activities (working on projects, action plans, experiments, applying in practice, etc.)	.63
10. By the way I teach, I encourage my students to use the theoretical aspects learned in solving various practical problems.	.72
16. In my teaching activity, I encourage my students to experiment in practice the things they know in theory.	.75
20. After teaching a lesson, I encourage my students to find practical applications for what they have learned.	.72
7. Through teaching, I encourage my students to implement in practice the plans and strategies theoretically verified in class.	.74

Note: CA = creative abilities; RA = reproductive abilities; AA = analytical abilities; PA = practical abilities

The results presented in Table 4 indicate that the scales have a good internal consistency (alpha Cronbach ranging from .79 for the teaching style which stimulates creative abilities to .84 for the teaching style which stimulates practical abilities).

Table 4. Scale reliability and between-scale correlations

Teaching style that stimulates...	M	SD	Creative abilities	Reproductive abilities	Analytical abilities	Practical abilities
Creative abilities	22.12	3.27	.79			
Reproductive abilities	17.52	4.51	-.04	.85		
Analytical abilities	23.54	3.02	.65**	-.10	.78	
Practical abilities	23.64	3.24	.63**	-.03	.60**	.84

Note: N = 362. Scale reliability coefficients are presented on the diagonal of the correlation matrix. Internal consistency indices are presented in italics on the diagonal.** correlation coefficient significant at $p < .01$

Analysis of the relationships between scales indicated that the teaching style stimulating reproductive abilities does not correlate significantly with any of the other three teaching styles (correlation values range between -.10 and -.03). On the other hand, we found significant correlations between the other three scales of the questionnaire. According to the results presented in Table 4, these scales are inter-correlated at .60-.65, indicating a common variance of approx. 36-40%. In light of these results, we investigated whether the three highly inter-correlated teaching styles should be considered as a single, major factor. Therefore, using confirmatory factor analysis, we assessed the fit of a model that assumed the existence of two factors: teaching style which stimulates reproductive abilities, and teaching style which stimulates analytical-creative-practical abilities. The fit indices of this model had unacceptably low values ($\chi^2(170)=491,96$, $p<.001$, GFI = .87, AGFI = .84, CFI = .89, RMSEA = .072).

6.2. Construct and discriminant validity of the TSI-Q

6.2.1. Relationships with the Thinking Styles

The teacher's thinking styles are manifested in the form of teaching styles (Zhang, 2005, 2008). Therefore, we used correlations between teaching styles and teacher thinking styles to evaluate the construct validity of TSI-Q. Results presented in Table 5 indicate that correlations between these two constructs (described in Table 1) range from .25 to .50, which indicate medium and strong associations (according to the criteria suggested by Cohen, 1988) between the two questionnaires and good construct validity of the TSI-Q scale.

Table 5. Relationships between TSI-Q scales and thinking styles

Teaching style that stimulates / Thinking style	Creative abilities	Reproductive abilities	Analytical abilities	Practical abilities
Legislative	.326**	-.112	.358**	.351**
Executive	.040	.230**	.168**	.128
Judicial	.332**	-.004	.452**	.369**
Monarchic	.054	.236**	.024	.001
Hierarchical	.171	.148	.213**	.201**
Oligarchic	.160*	.143	.022	.059
Anarchic	.280**	.110	.129	.137
Global	.093	-.011	.032	.169*
Local	.044	.320**	.013	-.005
Internal	.042	.106	.050	.036
External	.254**	-.02	.301**	.297**
Liberal	.486**	-.107	.434**	.506**
Conservative	-.118	.421**	-.052	-.085

Note: N = 172. * correlation coefficient significant at p<.05. ** correlation coefficient significant at p<.01

One can notice that all three teaching styles relevant to successful intelligence (creative, analytical and practical) correlate significantly with the legislative, judicial, anarchic, external and liberal thinking styles. These thinking styles show preference for tasks that can be solved by interacting with others (the external style), have a low structuring level (anarchic style), necessitate complex processing of information (legislative and judicial styles), originality (liberal style) and autonomy (Zhang and Sternberg, 2005).

Also, one can identify a pattern of associations specific to each teaching style. The teaching style which stimulates creative abilities is significantly associated with the oligarchic thinking style, which indicates a preference for multiple tasks – without establishing priorities (Zhang, 2001a, 2004b; Zhang and Sternberg, 2005; Zhang, 2008).

However, we found differences when we analyzed the relationships between each of these teaching styles and the global thinking style. The teaching style which stimulates analytical abilities does not correlate significantly with the global thinking style, whereas the relationship between the teaching style which stimulates practical abilities and the global thinking style is significant.

In the case of teaching styles relevant to stimulating *analytical* and *practical* abilities, we obtained significant associations with the *hierarchical* thinking style. People with a preference for this style are focusing their attention on tasks prioritized according to their assigned value (Zhang, 2001a, 2008). Moreover, in the case of the teaching style relevant to stimulating *practical* abilities we found a significant relationship with the *global* thinking style, which reveals a greater interest in a global, overall perspective of issues (Zhang, 2001a).

In the case of the teaching style relevant to stimulating *reproductive abilities*, we obtained significant relationships with the *executive, monarchic*, *local* and *conservative* thinking styles.

6.2.2. Relationships with the Big Five Model

The relationships between the four teaching styles and the personality traits of the Big Five model (Table 6) are consistent with the results identified in literature by Macsinga et al. (2010). The teaching style relevant to stimulating student *creativity* positively correlates with *openness to experience* and *extraversion*. The teaching style relevant to stimulating *analytical abilities* correlates with *conscientiousness* and *agreeableness*, and the teaching style relevant to stimulating *practical abilities* positively correlates with *agreeableness*.

Table 6. Relationships between TSI-Q scales and the Big Five traits

Teaching style that stimulates / Big Five scales	Creative abilities	Reproductive abilities	Analytical abilities	Practical Abilities
Openness to experience	.220*	-.091	.120	-.016
Extraversion	.213*	.113	.080	.081
Conscientiousness	.056	-.021	.188*	.094
Agreeableness	.196*	-.094	.299**	.227*
Emotional Stability (low Neuroticism)	-.149	.065	-.033	-.121
Social Desirability Scale (DECAS)	.050	.066	.087	-.067
Approval Scale (DECAS)	.053	.127	-.096	-.037

Note. N = 125. * correlation coefficient significant at p<.05. ** correlation coefficient significant at p<.01

6.3. *Relationships with demographic variables*

The analysis of the relationships between TSI-Q scales and demographic variables offers information about the extent to which the results are influenced by these research artifacts. Generally, the relationships between the teaching styles and the demographic variables are weak and statistically insignificant.

Table 7. Individual differences in teaching styles

Teaching style that stimulates / Demographics	Creative abilities	Reproductive abilities	Analytical abilities	Practical abilities
Level of teaching	t(318)=1.65 p=.099	t(318)=4.17 p=.001	t(318)=0.13 p=.896	t(318)=1.30 p=.194

	t(344)=2.39	t(344)=1.34	t(344)=0.38	t(344)=1.97
Gender	p=.017	p=.181	p=.704	p=.049
	t(279)=0.82	t(279)=0.25	t(279)=0.74	t(279)=0.66
Type of discipline	p=.413	p=/803	p=.456	p=.510

Although the results obtained by this study do not show a significant relationship between the four teaching styles and teacher *length of service in education* (correlation values range between .035 and .081*)* or teacher *age* (correlation values range between .015 and .085), previous research studies indicated that these two variables are associated with a decrease in legislative thinking style (Sternberg and Grigorenko, 1995; Zhang and Sachs, 1997) and an increase in executive thinking style (Sujan, 1995).

Regarding the *specialization* of participants, we found no significant relationships between the type of disciplines taught (humanities/social vs. exact sciences) and teaching style. Although previous research (Zhang and Sternberg, 2005; 2006) indicated that teachers in technical colleges have thinking styles different from teachers in humanities colleges, our results did not confirm such findings.

Other results have shown that men are less likely than women to adopt teaching styles relevant to stimulating *creative* (t(344)=2.39, p = .017, d=0.28, $mean_{women}$ = 23.59, $mean_{men}$=22.73) and *practical* (t(344)=1.97, p = .049, d=0.22, $mean_{women}$ = 24.02, $mean_{men}$=23.30) abilities. Although statistically significant, these relationships are weak when considering their effect size, according to guidelines provided by Cohen (1988).

The results also indicated that high school teachers more often adopt a teaching style relevant in stimulating *reproductive* abilities (t(318)=4.17, p<.001, d = 0.47, $mean_{highschool}$=18.10, $mean_{college}$=15.33).

7. Discussions

The aim of this research was to develop and validate a questionnaire that would allow the identification of teachers' preference for teaching styles that stimulate reproductive, analytical, creative or practical abilities. The starting point of the present study arose from academic educational practice, as well as from results of previous research studies in the field of teacher-student relationships (Sternberg, Torff and Grigorenko, 1998a; Grigorenko and Sternberg, 2001; Sternberg, 2002, 2003a).

In its final version, TSI-Q is made up of 20 items that assess the four teaching styles relevant for successful intelligence: reproductive, analytical, creative and practical (Appendix 1 – Romanian version of TSI-Q). The TSI-Q scales have a satisfactory internal consistency (Cronbach's alpha above .78), but correlations between the scales are high (up to .65). Despite these strong associations, the TSI-Q scales show discriminative validity, indicating the fact that they assess different teaching styles.

7.1. Relationships with Thinking Styles

As the activity of teaching involves dealing with large volumes of information which need to be structured, and solving any problems that might occur during communication with students (Petrovici, pp. 69-70), thinking styles are concepts that should be closely associated with teaching styles (Zhang, 2005, 2008). Therefore, associations between TSI-Q and the Thinking Styles Inventory (Sternberg & Wagner, 1992) were used to assess the construct validity of our teaching style questionnaire.

Our results indicated that people who use teaching styles relevant to developing successful intelligence prefer less structured tasks, allowing the application of their originality and cognitive complexity, as well as their freedom to do things in a personal manner. Teachers who adopt a teaching style relevant to the development of *creative abilities* do not adhere to existing rules and procedures, but are more likely to focus on several objectives at the same time, without prioritising them. Educators who adopt a teaching style relevant to the development of *analytical abilities* target multiple goals and have the capacity to rank them according to their value while they are focusing on implementation. Teachers focused on developing *practical abilities* are also focused on implementation and action but granted more attention to the overall perspective. Therefore, taken together, the three teaching styles (creative, analytical and practical) are associated with thinking styles which Zhang (2001b) defined as favouring creativity (legislative, judicial, anarchic and liberal). At the same time, results indicated elements specific to each style. The presence of these specific elements supports our decision to differentiate between the three styles. The teaching style relevant to stimulating reproductive abilities was associated with thinking styles that show a preference for rules and norms and a low level of cognitive complexity. These thinking styles are also considered to inhibit creativity (Zhang and Sternberg, 2005; Zhang, 2008).

When considering the relationships between thinking styles and teaching styles for successful intelligence, Zhang (2007) obtained results similar to those found by the present research. In her study, Zhang (2007) reported significant correlations between legislative, global and liberal styles – and analytical abilities; between legislative and liberal styles – and creative abilities; between legislative, executive and global styles – and practical abilities (Zhang, 2007, p. 832). These results were replicated in the present study, and they are evidence for the construct validity of the TSI-Q scales.

7.2. Relationships with the Big Five Model

Teaching styles are variables that describe stable behavioural patterns in the teaching activity (Zhang, 2008). Their stability indicates that teaching styles should share some variance with personality variables. Therefore, we investigated the relationships between TSI-Q scales and the most frequently used personality model.

Zhang (2002) and Zhang and Huang (2001) have obtained results which highlight the fact that the *extraversion* and *openness* dimensions significantly correlate with more complex and creative thinking styles (external, progressive, judicial), a fact convergent with the results obtained in this paper, which highlights the relationship between these two dimensions and the teaching style relevant for stimulating creative abilities. The *conscientiousness* dimension encompasses facets such as competence, order, sense of duty, desire for self-achievement, perseverance and deliberation (Costa and McCrae, 1992). The high scores in *agreeableness* characterise altruistic people, who value and respect social conventions and other people's beliefs (Costa and McCrae, 1992). These traits are associated with the teaching style that stimulates analytical abilities, because this teaching style assumes an ordered, perseverant and supportive approach. *Agreeableness* is, at the same time, the personality factor in the Big-Five model with the largest impact on the quality of interpersonal relationships (Costa and McCrae, 1992), and is an essential element in stimulating practical abilities in students who need to convince others of the value and applicability of their ideas.

7.3. Relationship with demographic variables

In the case of TSI-Q, the absence of significant correlations between teaching styles and demographic variables such as age, length of service in education, or specialization has positive implications because it indicates that the questionnaire results are not influenced by such research artifacts. Therefore, results provided by further research should not be influenced by samples that are unbalanced from this point of view. However, these results could indicate (a) a problem with the TSI-Q scales, or (b) the existence of moderator variables that the current research did not take into consideration.

Regarding high school teachers' preference for a teaching style that stimulates reproductive abilities, a possible explanation for this result may be the fact that Romanian education is mainly theoretical at a high school academic level, focused on information and attainment rather than on application (Paloş and Munteanu, 2009). At the level of college education, in the context of a higher degree of specialization, teachers need to be less theoretical in their teaching style.

8. Implications for further research

Although the TSI-Q may contribute to assessing teachers' preferences for teaching styles relevant to stimulating students' creative, analytical, practical and reproductive abilities, it has its limitations. Firstly, the TSI-Q is a self-report questionnaire that depends on the ability of respondents to be accurate in their introspection and so it could be affected by distortions such as social desirability or tendency towards approval (Cools and Van Den Broeck, 2007). Our analyses found insignificant relationships between the TSI-Q scales and the protocol validation scales of the DECAS inventory (social desirability and tendency towards approval). These results suggested that the TSI-Q results are not associated with the tendency of participants to present themselves in a positive, socially desirable manner (correlation values range between -.067 and .087) nor with the tendency to agree with the items regardless of their content, as highlighted by the DECAS scale of approval (correlation values between -.096 and .127). Nevertheless, further research is needed to investigate relationships between the TSI-Q and the actual behaviour of teacher in the classroom.

A second possible limitation of the present study is related to sample size. Although the sample might seem small for research that reports the process of scale development, it complies with the criteria for conducting confirmatory factor analyses: a subject-to-item ratio above 10 (for analyses on the 32-items version), and a subject-to-item ratio above 15 (for analyses on the 20-items version). Therefore, we believe that a larger sample would not have provided different results.

Thirdly, the structure of the studied sample represents other limitations of the current study. Balancing these characteristics of the sample would be useful for obtaining a clearer image of the results obtained with regard to demographic variables. This way, one could see why the questionnaire does not confirm previous research data regarding the relationship between demographic variables and teaching styles or whether it presents a good resistance to the research artifacts. Also, applying the questionnaire to secondary school teachers (teaching children aged 11-14) would help determine the most frequently used teaching style at this academic level.

Finally, another limitation of the questionnaire could be that the successful intelligence model proposed by Sternberg (1999, 2003) may not be familiar to teachers. This might mean that teachers would find it difficult to detect the subtle differences between what it means to teach in order to stimulate the students'

analytical, creative or practical abilities, given that Romanian education particularly stimulates the students' analytical and reproductive abilities (Paloş and Munteanu, 2009).

This research employed theories and models that are not specific to Romanian culture. Therefore, we consider that the findings presented in this paper are useful for an audience beyond Romania's borders. In addition, the methods used for validating the TSI-Q (the Thinking Style Inventory or the Five Factor model) are not specific to Romania. We consider it encouraging that some of our results successfully replicated findings from different cultures. For example, our results were similar to the results reported by Zhang (2007) on a Chinese sample, using different methods. Therefore, further research is needed to investigate the validity of the TSI-Q and psychometric parameters in other cultures.

9. Conclusions

The TSI-Q is a valuable new instrument for assessing teachers' preferences for teaching styles relevant to stimulating the student's creative, analytical, practical and reproductive abilities. It is necessary to emphasize that this questionnaire does not measure teachers' efficiency in the classroom; it only allows, by means of self-assessment, the evaluation of teachers' preferences for teaching situations relevant to stimulating the four types of abilities. Therefore, the results of the TSI-Q provide a guide that teachers can use in the analysis of the strengths and weaknesses of their teaching activity, from the perspective of successful intelligence (Sternberg, 1988). Subsequently, teachers can deliberately focus on developing one or another of these abilities, for the benefit of the students whom they work with.

In conclusion, we can state that Sternberg's suggestion of approaching teaching from the perspective of successful intelligence results in harnessing (a) the thinking styles that stimulate students' creativity (such as the legislative, judicial, anarchic and liberal styles), and (b) the personality traits that highlight the students' independence in thinking, desire for self-achievement and respect towards others' beliefs (2003a). Adopting this perspective in teaching should be followed up by an adapted evaluation, according to the teaching style that would allow students to harness the three types of abilities (Zhang, 2005; Sternberg, 2008a).

Appendix 1. Romanian version of TSI – Q

Itemi	Dezacord foarte puternic (1)	Dezacord puternic (2)	Dezacord (3)	Acord (4)	Acord puternic (5)	Acord foarte puternic (6)
1. În activitatea mea de predare pun accentul pe crearea de situaţii în care să dezvolt capacitatea de memorare a elevilor.						
2. Când predau, pun accent pe capacitatea elevilor de a analiza informaţiile care le sunt oferite (de ce se						

întâmplă un anumit lucru).

3. Mă folosesc în activitatea mea de predare de jocuri (de cuvinte, de rol etc.) pentru a face învăţarea mai uşoară.

4. Prin modul în care-mi structurez predarea, stimulez gândirea creativă a elevilor.

5. Prefer activităile de predare în care elevii au posibilitatea de a compara i de a găsi diferene între două sau mai multe situaii, probleme sau informaii oferite.

6. În activitatea mea de predare valorific imaginaţia elevilor în rezolvarea de probleme (imaginarea de situaţii, explorarea de noi idei etc.).

7. Prin predare, îmi încurajez elevii să implementeze în practică planuri i strategii verificate teoretic la clasă.

8. Prefer tipul de predare în care să creez situaţii pentru ca elevii să poată reproduce/repeta cunoştinţele acumulate în activitatea la clasă.

9. În activitatea mea de predare încurajez elevii să presupună diverse situaţii şi apoi să gândească ce anume s-ar putea întâmpla dacă lucrurile ar fi aşa cum au presupus ei.

10. Prin modul meu de predare încurajez elevii să utilizeze în rezolvarea diferitelor probleme practice aspectele teoretice predate.

11. Prin modul în care-mi structurez predarea, stimulez gândirea reproductivă a elevilor.

12. În activitatea mea de predare stimulez la elevi gândirea critică (de a evalua, de a testa ipoteze i de a le alege pe cele mai potrivite, de a le respinge pe cele inadecvate etc.).

13. În predarea la clasă pun accentul pe activităţile practice ale elevilor (realizarea de proiecte, planuri de acţiuni, experimente, lucrări practice etc.).

14. În activitatea mea de predare pun accent pe acumularea de către elevi a unui volum cât mai mare de informaţii.

15. Prefer situaţiile de predare în care elevii pot judeca valoarea caracteristică a diferitelor informaţii oferite (a diferitelor legi, modele, metode etc.).

16. În activitatea mea de predare îmi încurajez elevii să experimenteze în practică lucruri pe care le ştiu teoretic.

17. În activitatea mea de predare favorizez şi apreciez utilizarea memoriei de către elevi în procesul de învăţare.

18. În activitatea de predare accentuez capacitatea elevilor de a explica modul în care se petrec anumite procese sau cum funcţionează anumite lucruri (cum se întâmplă un anumit lucru).

19. Prin modul în care predau îmi stimulez elevii să descopere moduri noi de funcţionare, principii sau legi ce pot fi aplicate in diferite situaţii.

20. După ce am predat o lecţie, încurajez elevii să pună în practică cele învăţate la clasă.

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