Implicit Theories of Intelligence and Personality, Attitudes towards Uncertainty, and Academic Achievement in College Students: A Cross-Cultural Study

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Abstract

Implicit theories of personality and intelligence and goal orientations constitute an important part of the complex system of personality predictors of academic achievement. The goal of our cross-cultural study was to compare the relationships between these theories, tolerance/intolerance for uncertainty, and academic achievement in Russian and Azerbaijani students. We established the cross-cultural invariance of the factorial structure of Implicit Theories Inventory in Russian and Azerbaijani samples. 265 Azerbaijani students and 359 Russian students participated in the main study. Azerbaijani students showed higher levels of performance goals (compared to mastery goals), compared to Russian students. They also showed higher levels of belief that intelligence is malleable and develops in learning contexts. At the same time, Russian students had significantly higher tolerance and significantly lower intolerance for uncertainty, compared to Azerbaijani students. However, we argue that these group differences could potentially be attributed to gender-specific cross-cultural differences in intolerance foe uncertainty in men, but not women.

1. Introduction

1.1 Implicit theories of intelligence and personality

Implicit theories include an unconscious set of lay beliefs used to reason about self and other people. In every day contexts, people establish complex schemata of assumptions about other people's behavior that are in turn used to guide reasoning and action The concept of implicit theories is connected with the idea of personal constructs developed in Kelly's personality theory [32]. The first systematic study of implicit theories of intelligence was conducted in 1947 [16]. Implicit theories were contrasted with explicit theories developed as part of the advancement of scientific knowledge in a set of other studies conducted by R. Sternberg in the 1980_s [42]. Nowadays implicit theories of intelligence are viewed as a factor that influences one's expectations from and evaluations of other people. They were also proposed to affect self-evaluations of intelligence and, consequently, achievement and success in multiple different domains of life, including the academic one [36].

C. Dweck studied implicit theories as factors of the internal determination of students' learning [15, 24]. Her studies showed that people differ in their conceptions of intelligence and personality, thinking of these psychological attributes as either constant (entity theorists) or malleable (incremental theorists). These components of self-concept were proposed as significant sources of individual differences in educational attainment.

In her studies of the influence of implicit theories of intelligence on a process of formulating life and educational goals, Dweck noted that many individuals tend to choose goals that are oriented towards the end-result (performance goals). For these individuals, a positive self-esteem and avoidance of failure are of key importance. Others choose goals that are focused on learning (correspondingly, learning or mastery goals).

Individuals that view intelligence as a constant (quantitative) trait appreciate easy success and strive to be better than others in every activity they engage in. Obstacles on their way to achieve their goals and peer success might force them to doubt their intellectual ability, Conversely, people who view intelligence as a changeable trait that can be enriched/developed through learning have less fear of challenges and obstacles.

Studies that investigate the impact of personality traits and self-assessed intelligence (SAI) on academic achievement, are frequently based on Dweck's idea

that implicit theories precede and regulate goal setting and motivation, with significant consequences for learning [8]. For example, Furnham and colleagues [23] reported a significant positive correlation (r = .35) between the incremental theories of intelligence and the level of SAI.

Dweck developed several questionnaires for measuring incremental and entity theories of intelligence and personality [15]. She also developed a scale for measuring learning goals as oriented performance or learning. She showed that mastery goal orientation is linked to the motivation to solve complex problems and challenging tasks, unlike the performance orientation that leads to avoidance of such tasks. These findings correspond to the main approach in the field. Most often in publications concerned with goal orientations (as per our estimate of about one third of the total number of the published studies) they are viewed as specific goals related to achievement motivation and discussed in the framework of contrasting mastering vs. performance goals (the orientation to improve the competence vs. to demonstrate the competence to other people) [12].

During the validation of Dweck's scales in Russian student samples we added the academic self-concept scale to the inventory [36, 38]. The main reason for this addition was the to take into consideration the functional role of the Self-concept in the processes of goal formation. We suggested that the representation of one's place in the students academic 'hierarchy' and self-evaluations of one's efficiency and value of learning efforts should be measured together with learning goals as parts of the united system of the self-regulated learning.

1.2 Learning goals and academic achievement

Subjective representations of learning goals and academic self-concept are included into a more broad concept of self-efficacy. In the Bandura's approach, the concept of self- efficacy includes the assumption of its motivational effects on the processes of learning through goal formation [4]. Goals provide the basis for self-regulation of learning effort through implicit standards that are used to control and adjust relevant learning strategies. Students with high academic self-efficacy use more effective learning strategies (both cognitive and motivational meta-strategies) and manage time better; generally, they are more efficient in the exploration of the environment, self-control, and in effort regulation [9]. Thus, we assume that goal orientations as part of self-efficacy should be considered as integrated in the united system of the self-regulated learning that also draws on self-concept and implicit theories. In our previous studies, found that incremental theories of intelligence and self-assessed intelligence in Russian student samples were positively related with the level of conscious self-control whereas learning goals were correlated with the control flexibility [38].

Goal orientations are related to successful knowledge transfer from a learning situation to a real one [17]. Thus, students with mastery goals are characterized by high levels of metacognitive activity. For these students, similarity of skills acquired during the training series with skills required in the test task was considered as more important than the similarity of elements of these different tasks. Thus, they were hypothesized to gradually increase the complexity of training tasks to gain a fuller understanding of the matter and acquire the required competence. However, the resulting model did not demonstrate the relationship between goal orientation and learning strategies. Instead, the only one significant relationship observed was obtained the negative relationship between performance goals and self-efficacy.

Blackwell with coauthors aimed to examine the relationships between motivational variables, implicit theories of intelligence, and academic achievement [5]. Results of their two studies were combined using methods of the structural equation modeling in the unified model. In this model, learning goals mediated the relationship between incremental theories of intelligence and positive coping strategies. Positive strategies, in their turn, mediated the relationship between learning goals and academic achievement. The third mediational effect was observed for the belief in efficiency of learning efforts: it mediated the relationship between incremental theories of intelligence and positive strategies of coping with a failure. The main conclusion was that incremental intelligence theorists tended to have mastery goals (i.e., to learn as much as possible even if it is difficult). They also believed that intelligence was necessary for learning and leads to higher achievement. When they failed, these students did not consider their failures to be a consequence of the insufficiency of their ability, but rather were ready to work further to avoid similar situations in the future.

Aronson, Fried and Goode performed a comparison of students who learned the incremental theory of intelligence with two control groups [3]. The results of the SAT exam showed that students trained in the incremental theory of intelligence got significantly higher scores than students in other groups. This result suggests that implicit theories of intelligence can be changed, and that, in turn, can influence academic achievement.

Dupeyrat and Marine [14] showed that performance goals lead to the realization of facile strategies in a sample of adults who did not finish school for various reasons and decided to resume their education. These authors reported two interesting results. First, different types of learning strategies were unrelated to academic achievement. Second, unlike Dweck, these authors did not obtain a correlation between the incremental theory of intelligence and mastery goals. They explained this

fact through the idea that respondents' implicit theories of intelligence could be multidimensional and domain-specific as it was originally suggested by R. Sternberg [42]. According to this idea, in some areas participants considered their abilities as developing and incremental, and in other areas – as constant and invariable.

1.3 Implicit theories, learning goals and tolerance/intolerance for uncertainty

The concept of tolerance/intolerance for ambiguity has changed since its the first introduction in E. Frenkel-Brunswick's studies [18, 19]. The distinction between tolerance for ambiguity (TA) and tolerance for uncertainty (TU) has been noted in different fields of psychology [22, 25, 40]. TA is concerned with the response to the ambiguity of stimulation in the actual situation whereas TU is considered as the perception of uncertainty in the future and as the person's emotional experience that is evoked by this uncertainty.

We previously showed that traits related to coping with uncertainty were connected to multiple components of self-concept [35]. Using SEM, we found that the latent variable of Uncertainty and Risk Acceptance (which was manifested in tolerance for uncertainty, risk readiness and faith in intuition) was related to self-assessed intelligence [37]. We hypothesized that self-assessment of intelligence requires overcoming uncertainty as the part of the internal dialogue during self-concept formation and, at the same time, is rooted in implicit theories of intelligence. Viewed implicit theories as regulatory representations of the self-consciousness [24] we suggested that self-assessed intelligence and implicit theories of intelligence should be closely related, as the latter relies on the implicit theory of what intelligence and intelligent behavior are.

Based on this cursory review of the literature, we hypothesized that students that have the incremental theory of intelligence and mastery goals should have high tolerance for uncertainty since all three are oriented towards the future (as opposed to, for example, the present reflects in the current self-concept and its evaluations).

1.4 Cross-cultural context of implicit theories and tolerance/intolerance for uncertainty

The idea of cross-cultural differences in attitudes towards uncertainty has been originally developed in economic and management studies [28, 29]. In 1980s, Hofstede developed the Uncertainty Avoidance Index for different cultures that tapped into the national specifics of attitudes towards uncertainty [28]. This index is used in empirical studies of cultural differences in economic decisions. For instance, Frijns with colleagues [20] showed that CEOs of firms based in countries with lower levels of uncertainty tolerance, as measured by Hofstede's index, require higher premiums on takeovers. Another study [30] found that countries with high uncertainty avoidance grow disproportionately slower in industrial sectors where information is generally less available. Based on the work of Guiso and colleagues [26], who found that national uncertainty avoidance is significantly and substantially (in terms of the effect size) lower in countries with a higher fraction of Protestants, and significantly higher in countries with a higher fraction of Catholics, Huang tested a hypothesis that confessional composition has an effect on the Hofstede's index. Results showed that the fractions of Protestants, Catholics, and Muslims in the population predicted national uncertainty avoidance. We believe that the next step in the developing field of psychology of uncertainty it would be to attribute cross-cultural differences in attitudes towards uncertainty to those in its other personality correlates.

A set of comprehensive studies of cross-cultural differences in implicit theories of intelligence in different countries of Africa, Asia and Europe was reviewed by Sternberg and Ruzgis [43]. They showed that non-European countries were characterized by higher attention to social manifestations of intelligence. Dweck reported results of the comparisons of the relationships between implicit theories and lay dispositionism in the United States (a more individualistic culture) and Hong Kong (a more collectivistic culture) and showed that this relationships was generalizable across cultures [10]. Another study that compared cross-cultural differences in the Western vs. Eastern cultures [39] showed that Korean adults emphasized social skills in implicit intelligence theories to a greater degree than Americans and several other Asian samples studied previously. Comparisons of implicit theories of creativity in American and Indian samples results revealed significant cross-cultural differences for intellectual and attitudinal clusters of adjectives that describe creativity [41]. Thus, the obtained profile of results is highly complex and heterogeneous, necessitating further studies.

Correspondingly, the aim of our study was to compare implicit theories of intelligence and personality, goal orientations and tolerance/intolerance for uncertainty in two samples of Azerbaijani and Russian students. Importantly, we relied on the identity of the educational programs used in Moscow and Baku (as branches of the same institution that also commissions visiting professors that teach at the main branch) and the fact that we observed significant cross-cultural differences in self-regulation of learning in these two samples. The identity of the educational programs and the commonality of the language (i.e., Russian was used for teaching in both samples) allowed us to conduct a cross-cultural study of learning regulation that was at least partially free from the

influences from linguistic factors and factors related to the differences in the educational systems.

Russia and Azerbaijan share nearly seven decades of the common history in the Soviet Union. These circumstances pulled together social representations in these cultures in many aspects. In contrast, before the Soviet Union formation these two cultures were very different: Azerbaijan was more traditional and religious country than Russia. Nevertheless, the countries have been evolving independently for over twenty years. A comparison of socio-economic variables in these countries suggests they exhibit differences in several indexes that are proximal to uncertainty avoidance. For instance, Azerbaijan has higher levels of the Index of Economic Freedom than Russia [1, 31] that suggests that its economic environment provides more options for its citizens. Conversely, Russia is a more secular country than Azerbaijan: 83% religious citizens in Russia vs. 99% religious citizens in Azerbaijan [27]. Thus, studying possible cross-cultural differences in attitudes towards uncertainty between these countries could be informative in further studies, especially given the fact that the Uncertainty Avoidance Index has not yet been computed for Azerbaijan [2].

We tested the following hypotheses in our study:

H1. Russian and Azerbaijani students differ in the psychological texture of implicit theories and goal orientations. We expected

1) a higher level of incremental theories in the Russian sample as Russian students have more opportunities for the confirmation of their intellectual competence due to the wider/larger sphere/network of professional communication;

2) a higher level of performance goals in the Azerbaijani sample since for them academic achievement is potentially the most informative indicator of their learning efficiency.

H2. Russian and Azerbaijani students differ in attitudes towards uncertainty. We expected to observe higher tolerance for uncertainty/ambiguity in the Russian sample and higher intolerance for uncertainty/ambiguity in the Azerbaijani sample due to the differences in the religiosity.

H3. Students that hold incremental implicit theories were expected to be more tolerant of uncertainty than students with entity theories within both samples.

H4. Students with incremental implicit theories and tolerant attitudes toward uncertainty should demonstrate higher academic achievement than students that hold entity theories and are intolerant of uncertainty within both samples.

Our complementary aim was to examine the cross-cultural invariance of Dweck's inventory with the added self-concept scale [36, 38]. This paper thus also presents such an analysis.

2. Method

2.1. Study design

At the first step, we performed an evaluation of the cross-cultural invariance of the self-concept scale and Dweck's scales united in the Implicit Theories Inventory [38]. In the second step, we performed a cross-cultural comparison of Russian and Azerbaijani students with respect to implicit theories, goal orientations and the attitude towards uncertainty.

2.2. Participants

1149 undergraduate students from Moscow State University named after M.V. Lomonosov from Moscow and from Baku (the Baku branch) participated in this study.

For the first step of the study, we recruited 884 Russian undergraduates (724 females and 150 males, 10 students did not specify their gender) in the age range from 17 to 60 years old (M = 21.10, SD = 4.87). We also recruited 265 Azerbaijani undergraduates (180 female, 85 male) from 16 to 27 years old (M = 19.20, SD = 1.83).

For the second step, 359 Russian students (303 females and 56 males) aged from 17 to 25 years (M = 19.35, SD = 0.98) from the original sample participated in the study and were contrasted with 265 age-matched Azerbaijani students (also part of the original sample).

2.3. Measures

2.3.1. Implicit Theories Inventory. Implicit theories, goal orientations, and academic self-concept were assessed using the Russian version of Smirnov's translation of Dweck's brief questionnaires [15, 36, 38]. Acceptance of the implicit theory of incremental intelligence (INT) and enriched personality (PER) reflect whether a student holds an "entity" or "incremental" theory of these attributes. Performance or mastery goals measure (*MAS*) reflects goal orientations: mastery goals aim at increasing competence, whereas performance goals are related to confirming competence and avoiding negative judgments. Seven additional items added in our previous studies form the academic self-concept scale (*ASC*). This measure measures students' beliefs about their overall effectiveness in learning and a subjective value of effort invested into it.

2.3.2. Tolerance for ambiguity. Tolerance and intolerance for ambiguity were measured using Budner's Intolerance of Ambiguity Scale [6], adapted into Russian [34]. Unlike the initial version of the questionnaire with one bi-polar scale, the Russian version distinguishes between tolerance for ambiguity (*TA*) and intolerance for ambiguity (*ITA*).

2.3.3. Tolerance for uncertainty. To asses tolerance and intolerance for uncertainty, we used the New Questionnaire of Tolerance for Uncertainty (NQTU) [33], which combines four different measures of tolerance for uncertainty [21]. NQTU consists of three scales: Tolerance for uncertainty (*TU*) as the ability to function in uncertain situations, Intolerance for uncertainty (*ITU*) as the desire to avoid uncertainty in the "world of ideas," and Interpersonal intolerance for uncertainty (*IITU*) as the desire for certainty and clarity in interpersonal communication and relationships.

2.3.4 Academic achievement. The baseline measure of academic achievement was students' GPA for the three semesters through official transcripts. Preliminary analysis of the distribution of GPA scores for the Russian sample has shown that it significantly differs from a normal distribution (*Kolmogorov-Smirnov Z with Lilliefir's correction* = .142, $p < 0.001$; *skewness* = -.87; *kurtosis* = -.13). Preliminary analysis of the distribution of GPA scores for Azerbaijani sample showed that it did not significantly differ from a normal distribution (*Kolmogorov-Smirnov Z with Lilliefir's correction* = .069, $p = 0.095$; *skewness* = .04; *kurtosis* = .40). The obtained non-normality of the GPA distribution in the Russian sample is consistent with our previous findings [36] and other research reports concerned with academic achievement in Russian students.

3. Results

3.1. Cross-cultural invariance of the Implicit Theories Inventory

We conducted verification of the cross-cultural invariance of the inventory in four steps [7]. At the first step, we used confirmatory factor analysis (CFA) to establish the 4-factor structure for the Implicit Theories Inventory for each of two samples as separate baseline models. At the second step, we verified the configural invariance of the inventory in two samples. At the third step, we estimated the measurement invariance of the inventory. Finally, at the fourth step, we verified the structural invariance of the inventory.

3.1.1. Factorial structure of the Implicit Theories Inventory. For both samples, we tested the original structure of the Inventory reported for Russian version of the scales in 2008 [38].

The 4-factor model of the Inventory (M1) demonstrated satisfactory fit indices in the Russian sample: *S-B* $\chi^2_{(317)}$ = 1277.26 $p < .0001$, *CFI* = .952, *RMSEA* = .059, *90% CI* .055, .062. Nonetheless, based on Lagrange's modification indices (Lagrange Multiplier, LM), we added 6 parameters into the model. These were error covariances for items with similar wordings: 1-6, 3-7, 7-21, 11-17, 16-20 and 23-27. The new model (M2) demonstrated significantly better fit than model M1: *S-B* $\chi^2_{(311)}$ = 879.16 $p < .0001$, *CFI* = .972, *RMSEA* = .046, *90% CI* .042, .049, and was used in the cross-cultural invariance analysis as the baseline model for Russian sample.

The 4-factor model of the Inventory (M3) did not demonstrate satisfactory fit in the Azerbaijani sample: *S-B* $\chi^2_{(317)}$ = 866.17 $p < .0001$, *CFI* = .827, *RMSEA* = .082, *90% CI* .075, .088. Based on LM, we added error covariances for items with similar wording (1-6, 1-12, 6-12, 7-14, 7-25, 10-18) into the model. The new model (M4) demonstrated significantly better fit than model M3, yet still far from satisfactory: *S-B* $\chi^2_{(311)}$ = 685.92 $p < .0001$, *CFI* = .882, *RMSEA* = .068, *90% CI* .061, .075.. Further LM-based modifications of the model did not result in model fit improvement. Thus, we decided to use model M4 in the cross-cultural invariance analysis as the baseline model for Azerbaijani sample, according to suggestions in the invariance testing literature [7].

3.1.2. Configural invariance of the Implicit Theories Inventory. The same parameters estimated on the first step in baseline models were estimated in the multigroup model. The aim of this analysis was to establish the invariance of the general structure of the inventory. Model M5 was identical to models M2 and M4 and united data from the two samples Model M5 showed satisfactory fit: *S-B* $\chi^2_{(616)}$ = 1490.00 $p < .0001$, *CFI* = .962, *RMSEA* = .050, *90% CI* .047, .053. Thus, we observed configural invariance of the inventory in Russian and Azerbaijani samples. The fit of model M5 was used to compare other nested models to it in order to determine the extent of invariance.

3.1.3. Measurement invariance of the Implicit Theories Inventory. The aim of this analysis was to estimate the invariance of the factor loadings in the two samples. All estimated factor loadings and one error covariance (for items 1&6) were constrained to be equal for Russian and Azerbaijani samples (model M6). Model M6 demonstrated satisfactory fit: *S-B* $\chi^2_{(645)}$ = 1598.76 $p < .0001$, *CFI* = .959, *RMSEA* = .051, *90% CI* .048, .054. Model M6 did not significantly differ from model M5 in term of fit (Δ*S-B* $\chi^2_{(29)}$ = 13.2526 $p = .995$, Δ*CFI* = .003). For model M6 nine constraints were found to be non-equivalent (i.e., factor loadings for items 1, 6, 8, 12, 18, 21, 26, 28, plus one error covariance). We tested the partial equivalent model (M7) while releasing those factor loadings[7]. Model M7 demonstrated satisfactory fit: *S-B* $\chi^2_{(635)}$ = 1526.06 $p < .0001$, *CFI* = .961, *RMSEA* = .050, *90% CI* .046, .053. Model 7 did not significantly differ from model M5 in terms of fit, (Δ*S-B* $\chi^2_{(19)}$ = 10.7270 $p = .933$, Δ*CFI* = .001). Thus we established the partial measurement invariance of the inventory in the two samples.

3.1.4 Structural invariance of the Implicit Theories Inventory. The aim of testing structural invariance was to verify the invariance of the factor covariances (i.e., latent structure). Thus, in addition to

constraints imposed on model M7, we constrained factor covariances to be equal in both samples. This model (M8) also showed satisfactory fit: *S-B* $\chi^2_{(641)}$ = 1526.45 $p < .0001$, *CFI* = .962, *RMSEA* = .049, *90% CI* .046, .052. Model M8 did not significantly differ from model M5 (Δ*S-B* $\chi^2_{(25)}$ = 5.877 $p = .999$, Δ*CFI* = 0).

Thus, our results revealed the cross-cultural configural, measurement and structural invariance of the Implicit Theories Inventory across Russian and Azerbaijani samples.

3.2. Cross-cultural differences in academic achievement and personality variables

Table 1 and Figure 2 present descriptive statistics for Russian and Azerbaijani students.

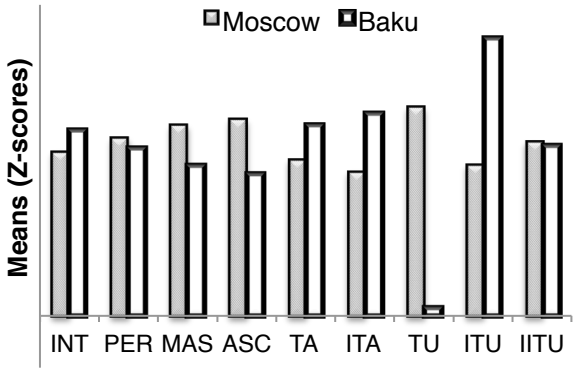

Figure 1. Means for personality variables in Russian and Azerbaijani samples (z-scores)

Table 1. Descriptive statistics for GPA and personality measures in Russian and Azerbaijani students

	Moscow, Russia			Baku, Azerbaijan		
	M	*SD*	N	*M*	*SD*	N
GPA	4.40	.54	339	3.69	.73	143
INT	6.22	6.44	359	7.02	6.23	265
PER	1.53	6.64	359	1.13	7.06	265
MAS	3.88	4.62	359	2.77	4.87	265
ASC	6.55	5.80	359	4.77	5.30	265
TA	29.9	4.30	107	30.7	4.32	107
ITA	27.4	6.34	107	29.4	5.50	107
TU	63.8	7.66	359	54.0	7.65	77
ITU	57.7	9.58	359	64.9	8.39	77
IITU	33.6	6.85	359	33.4	5.47	77

We found that Russian students had higher academic achievement than Azerbaijani students ($t_{(214.77)}$ = 10.418 $p < .001$, *Cohen's d* = 1.423). INT, PER and IITU did not significantly differ between Russian and Azerbaijani students ($t_{(622)}$ = -1.550 p = .122, $t_{(622)}$ = .726 p = .468 and $t_{(434)}$ = .186 p = .853, respectively).

Russian students showed higher scores on MAS, ASC and TU than Azerbaijani students ($t_{(622)}$ = 2.896 p = .004, *Cohen's d* = .232, $t_{(622)}$ = 3.934 $p < .0001$, *Cohen's d* = .315 and $t_{(434)}$ = 10.234 $p < .0001$, *Cohen's d* = .982, respectively). Azerbaijani students had higher scores on ITU and ITA than Russian students ($t_{(434)}$ = -6.058 $p < .0001$, *Cohen's d* = .582 and $t_{(207.78)}$ = -2.488 p = .014, *Cohen's d* = .345, respectively).

Thus, both measures of the attitudes towards ambiguity/uncertainty (TA/ITA and TU/ITU) showed that Azerbaijani students were more intolerant of uncertainty than Russian students. We did not find any significant cross-cultural differences in implicit theories of intelligence and personality. However, Russian students demonstrated higher mastery goals, academic achievement, and academic self-concept than Azerbaijani students.

3.3. Cross-cultural comparison of GPA and personality variables controlled for gender differences

Due to the inequality of the gender distributions in the two samples, we decided to verify the impact of gender on observed differences. Descriptive statistics for each sample separately are presented in Table 2. We used MANOVA with two independent variables: gender (male/female) and country (Russian/Azerbaijani) for each measured variable. We found a significant interaction between gender and country factors combined for ITA (F_{model} = 1280.382, $p < .0001$, F_{sex} = .281, p = .597, F_{sample} = 13.152, $p < .0001$, $F_{sex \times sample}$ = 9.458, p = .002). This interaction is presented graphically in Figure 2.

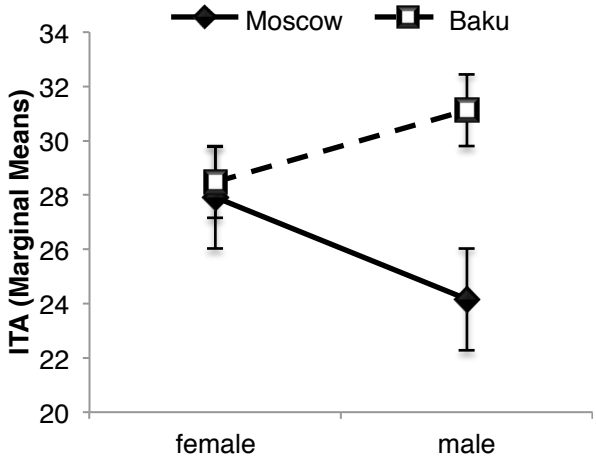

Figure 2. Interaction between gender and country

Russian men we less intolerant of ambiguity than Azerbaijani men. Women in both samples did not differ with respect to ITA.

Table 2. Descriptive statistics for personality variables split by country and gender

	Moscow, Russia						Baku, Azerbaijan					
	Female			Male			Female			Male		
	M	*SD*	N	*M*	*SD*	N	*M*	*SD*	N	*M*	*SD*	N
GPA	4.46	.51	290	4.05	.61	49	3.86	.67	91	3.40	.73	52
INT	6.25	6.03	303	6.04	8.42	56	7.14	5.44	180	6.74	7.68	85
PER	1.24	6.32	303	3.11	8.04	56	1.15	6.59	180	1.08	8.00	85
MAS	3.97	4.41	303	3.93	5.65	56	3.27	4.79	180	1.73	4.91	85
ASC	7.14	5.53	303	3.34	6.24	56	5.61	5.20	180	2.99	5.11	85
TA	30.00	4.27	94	29.39	4.65	13	31.42	4.38	67	29.73	4.04	40
ITA	27.90	6.30	94	24.15	5.83	13	28.48	5.64	67	31.13	4.86	40
TU	64.09	7.78	303	62.61	6.88	56	53.55	7.73	64	56.31	7.04	13
ITU	57.46	9.60	303	59.36	9.41	56	65.20	8.23	64	63.39	9.35	13
IITU	33.81	6.84	303	32.43	6.85	56	33.69	5.53	64	32.23	5.21	13

In the Russian sample, men demonstrated lower ITA, GPA and ASC than women ($t_{(105)}$ = 2.027 p = .045, *Cohen's d* = .396, $t_{(59.80)}$ = 4.445 p < .0001, *Cohen's d* = 1.150, and $t_{(357)}$ = 4.635 p < .0001, *Cohen's d* = .491, respectively).

In the Azerbaijani sample, men demonstrated higher ITA and lower GPA and ASC than women ($t_{(105)}$ = -2.468 p = .015, *Cohen's d* = .482, $t_{(141)}$ = 3.794 p < .0001, *Cohen's d* = .639, $t_{(263)}$ = 3.846 p < .0001, *Cohen's d* = .474, respectively). Additionally, men in the Azerbaijani sample had lower TA and MAS than women ($t_{(105)}$ = 1.988 p = .049, *Cohen's d* = .388 and $t_{(263)}$ = 2.418 p = .016, *Cohen's d* = .298s, respectively).

Thus, we assume that gender differences in tolerance for ambiguity are culture-dependent. Conversely, the gender differences in GPA and ASC seem to be similar in both countries: women had higher academic achievement and higher evaluation of their learning efficiency in both samples.

3.4. Cross-cultural comparison of the relationships between implicit theories and attitudes towards uncertainty

We divided each sample into two groups using the median split on the four scales of the Implicit Theories Inventory (INT, PER, MAS, ASC) separately. Using Student's t-test for independent samples, we compared attitudes towards uncertainty (TA/ITA and TU/ITU/IITU) between these groups Russian and Azerbaijani samples separately.

3.4.1. INT. Means for scores for attitudes towards uncertainty variables for students holding entity (E-INT) and incremental (I-INT) implicit theory of intelligence are presented in Table 3.

In the Russian sample, students holding the incremental implicit theory of intelligence had higher TU than students holding entity implicit theory ($t_{(357)}$ = -2.984 p = .003, *Cohen's d* = .316). In the Azerbaijani sample, students with the incremental implicit theory of intelligence demonstrate higher ITU than students with the entity theory ($t_{(75)}$ = -2.287 p = .025, *Cohen's d* = .528).

3.4.2. PER. Mean scores for attitudes towards uncertainty for students holding entity (E-PER) and enriched (En-PER) implicit theories of personality are presented in Table 4.

In the Russian sample, students holding the enriched implicit theory of personality had lower IITU than students with entity implicit theory ($t_{(357)}$ = 2.406 p = .017, *Cohen's d* = .255). In the Azerbaijani sample,

Table 3. Means for attitudes towards uncertainty variables for students with entity and incremental implicit theories of intelligence

	Moscow, Russia		Baku, Azerbaijan	
	E-INT	I-INT	E-INT	I-INT
TA	29.57	30.31	30.27	31.33
ITA	28.50	26.29	29.49	29.44
TU	62.65	65.04	54.93	52.97
ITU	57.04	58.46	62.90	67.17
IITU	34.25	32.95	33.24	33.67

Table 4. Means for attitude towards uncertainty variables for students with entity and enriched implicit theories of personality

	Moscow, Russia		Baku, Azerbaijan	
	E-PER	En-PER	E-PER	En-PER
TA	30.12	29.67	30.94	30.56
ITA	27.85	26.91	28.69	30.63
TU	63.22	64.54	54.02	54.00
ITU	57.45	58.09	63.37	66.64
IITU	34.43	32.70	33.49	33.39

Table 5. Means for attitudes towards uncertainty variables for students with performance and mastery learning goals

	Moscow, Russia		Baku, Azerbaijan	
	PG	MG	PG	MG
TA	29.52	30.72	30.06	31.91
ITA	28.47	25.44	30.29	28.19
TU	62.19	65.77	53.39	54.28
ITU	58.94	56.40	65.87	64.48
IITU	34.81	32.20	35.00	32.78

Table 6. Means for the attitudes towards uncertainty variables for students with high an low academic self-concept

	Moscow, Russia		Baku, Azerbaijan	
	L-ASC	H-ASC	L-ASC	H-ASC
TA	29.38	30.57	30.54	31.08
ITA	27.91	26.90	29.75	29.13
TU	63.28	64.51	54.22	53.83
ITU	57.79	57.73	65.36	64.49
IITU	33.40	33.82	33.61	33.29

we did not find any significant differences between these groups.

3.4.3. MAS. Mean scores for attitudes towards uncertainty for students with performance (PG) and mastery (MG) goals are presented in Table 5.

In the Russian sample, students with mastery goals showed higher TU and lower ITA, ITU, and IITU than students with performance goals ($t_{(357)}$ = -4.528 p < .00001, *Cohen's d* = .479, $t_{(96.85)}$ = 2.697 p = .008, *Cohen's d* = .548, $t_{(357)}$ = 3.651 p < .00001, *Cohen's d* = .386, and $t_{(357)}$ = 2.521 p = .012, *Cohen's d* = .267, respectively).

In the Azerbaijani sample, students with mastery goals had higher TA than students with performance goals ($t_{(357)}$ = 2.406 p = .017, *Cohen's d* = .255).

Thus, mastery goals were positively linked to tolerance for ambiguity in the Azerbaijani sample and with tolerance for uncertainty in the Russian sample. Additionally, in the Russian sample, students with mastery goals had lower intolerance for uncertainty/ambiguity than students with performance goals.

3.4.4. ACS. Means scores for attitude towards uncertainty variables for students with high (H-ASC) and low (L-ASC) academic self-concept are presented in Table 6.

Our analyses did of the ASC median groups did not identify any significant differences in attitudes towards uncertainty in these groups for both samples. Thus, there was no significant relationship between attitudes towards uncertainty and students' beliefs about their efficiency in learning.

3.5. Cross-cultural comparison of the relationships between academic achievement and personality variables

Pearson's bivariate correlations between study measures for the two samples are presented in Table 7. In both samples, GPA demonstrated significant positive correlations with MAS, ASC and TA (r = .152, .592 and .218 for the Russian sample and r = .253, .476 and .258 for the Azerbaijani sample, respectively), and significant negative correlation with ITU (r = -.190 for the Russian sample and r = -.625 for the Azerbaijani sample; all p's < .05).

In line with Dweck's hypothesis [15] and previous studies [14, 36], students with mastery goals had higher academic achievement than students with performance goals. Academic achievement was also positively related to students' beliefs in the effectiveness of their learning efforts, in line with research suggesting that self-concept plays an important role in achievement.

GPA was related to two components of attitudes towards uncertainty: TA and ITU. Thus, students who tolerate situational ambiguity better and accept the unpredictability in the future demonstrate higher academic achievement.

In the Azerbaijani sample, we obtained several additional correlations between GPA and personality variables. Specifically, academic achievement was negatively related to PER, ITA and IITU (r = -.184, -.404 and -.438, respectively; all p's < .05).

Thus, Azerbaijani students with higher intolerance for situational ambiguity and with higher desire for clarity and predictability in personal relationships demonstrated lower academic achievement. Surprisingly, we found that Azerbaijani students that hold enriched implicit theory of personality had lower GPA than entity theorists. This fact is in contradiction with Dweck's initial hypothesis and requires further investigation.

4. Discussion

4.1 Cross-cultural differences in implicit theories of intelligence and personality, goal orientations, and academic self-concept

In our study, we did not obtain significant differences in implicit theories of intelligence and personality between Russian and Azerbaijani samples. This result is partially consistent with previous findings [10, 39]. On the one hand, we can assume that this dimension of individual differences in implicit theories suggested by C. Dweck could be considered culture-free. On the other hand, we found cross-cultural differences in learning goals and academic self-concept. Supporting our first hypothesis, Azerbaijani students demonstrated higher performance goals and, respectively, lower mastery goals than Russian students. They also showed lower self-evaluation of the efficiency of their learning efforts than Russian students.

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Table 7. Correlations between GPA and personality variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	GPA	1	-.066	-.051	.152**	.592**	.218*	-.074	.050	-.190**	.075
(2)	INT	.164	1	.558**	.296**	.221**	-.011	-.140	**.164****	.052	**-.147****
(3)	PER	**-.184***	.425**	1	.204**	.053	-.101	**-.262****	.099	-.017	**-.181****
(4)	MAS	.253**	.276**	. 196**	1	.330**	.085	**-.247***	**.292****	**-.163****	-.271**
(5)	ASC	.476**	.185**	**.158****	.494**	1	.097	-,114	.064	.014	-.020
(6)	TA	.258*	.151	-,148	.177	.123	1	-.056	**.468****	**-.248****	.264**
(7)	ITA	**-.404****	-.112	.135	-,151	-.136	-.056	1	**-.522****	**.389****	**.372****
(8)	TU	.091	-.187	.016	.125	.015	-.047	-.287	1	**-.196****	**-.221****
(9)	ITU	-.625**	**.235***	.122	.006	-.083	.134	.370	.011	1	.275**
(10)	IITU	**-.438***	-.041	-.177	-.243*	-.124	.452*	.150	.059	.484**	1

Note: * is used for $p < .05$, ** is used for $p < .01$. Correlations for the Russian sample are presented above the diagonal and correlations for the Azerbaijani sample are presented bellow the diagonal. Bold style is used for significant correlations that differ in studied samples.

Thus, we found cross-cultural differences in goal orientations and academic self-concept but not in implicit theories between Russian and Azerbaijani students. We previously found [36] that implicit theories were related to learning goals and self-assessed intelligence but were not included in the structural model of self-regulated learning. We assumed that the relationship between implicit theories and learning goals could be mediated by self-assessed intelligence or other personality variables. This indirect relation can explain the differences in implicit theories and learning goals between Russian and Azerbaijani students obtained in the present paper and specify Dweck's hypothesis about the regulatory role of implicit theories in learning

The crucial cross-cultural difference was observed for academic achievement: Azerbaijani students demonstrated markedly lower GPA than Russian students. Considering the selective nature of the sample from a top-ranking university and the identity of educational programs and educators who assessed learning outcomes in both samples, we assume that cross-cultural differences in personality variables can partially explain differences in the self-regulated learning and academic achievement. This hypothesis is partially supported by the observed cross-cultural differences in mastery goals. We suggest that goal formation is driven by personality traits that define or influence the development of the representation of the actual situation [11]. Thus, cross-cultural differences in attitudes towards uncertainty could lead to cross-cultural differences in self-regulation of learning.

4.2 Cross-cultural differences in attitudes towards uncertainty

As predicted, Russian students demonstrated higher tolerance for uncertainty and lower intolerance for uncertainty/ambiguity than Azerbaijani students. This result supports the general hypothesis regarding the role of religiosity in uncertainty avoidance [26]. Nevertheless, we did not cross-cultural differences in tolerance for ambiguity. We also found that cross-cultural differences in intolerance for ambiguity were partially explained by the culture-specific gender differences in this trait. Given the noted differences between concepts of tolerance/intolerance for ambiguity and tolerance/intolerance for uncertainty [25, 40], we assume cultural influences are stronger for the attitude towards the unpredictability of the future than in the attitude towards the ambiguity in the actual situation.

According to results of the correlational analysis reported in Table 7, Russian students also have a more integrated attitude towards uncertainty. The correlational pattern demonstrated the high internal consistency of this multifaceted trait complex: almost all measures of tolerance/intolerance for ambiguity/uncertainty were related to each other in a predictable way. Conversely, in the Azerbaijani sample, we found partial independence of the different facets of attitude towards uncertainty. This suggests that there are pronounced cross-cultural differences in the psychological texture of attitudes towards between Russian and Azerbaijani students.

4.3 Association between implicit theories and attitudes towards uncertainty

In the third hypothesis of our study, we proposed that students holding incremental implicit theories should be more tolerant of uncertainty than students who hold entity theories (within both samples). Our results were only partially consistent with this hypothesis. The suggested pattern was obtained in the Russian sample. Students holding the incremental implicit theory of intelligence demonstrated higher tolerance for uncertainty than entity theorists. Incremental personality theorists also had lower interpersonal intolerance for uncertainty than entity theorists. However, we obtained the reverse patter in the Azerbaijani sample: students holding the incremental implicit theory of intelligence demonstrate higher intolerance for uncertainty than entity theorists.

To explain this inconsistency, we must first discuss the relationships between implicit theories and the attitudes towards uncertainty within the framework of

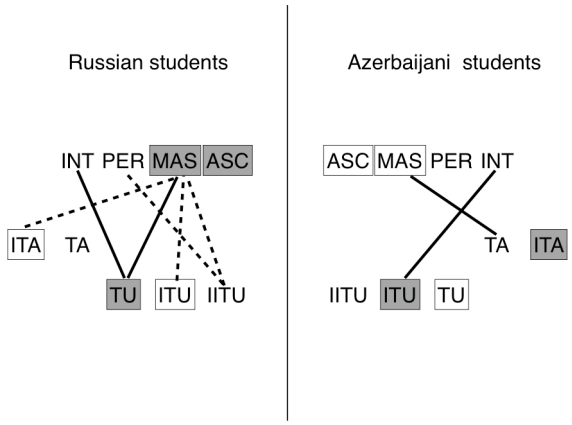

Figure 3. Relationships among implicit theories, goal orientations, academic self-concept, and attitude towards uncertainty in the Russian and Azerbaijani samples

Note. In Figure 3, boxes indicate variables with observed cross-cultural differences. Filled boxes represent higher scores. Solid lines indicate positive relationships and dotted lines represent negative relationships.

obtained cross-cultural differences. A graphical generalization of our results is presented in Figure 3.

As discussed earlier, Russian students were more tolerant of uncertainty than Azerbaijani students. We suggest that they consider uncertainty as an opportunity for developing their intellectual expertise. This representation of uncertainty is reflected in the relationship between intolerance for uncertainty and the incremental implicit theory of intelligence. The more the student appreciates the uncertainty as a environment for his/her development, the more he/she believes in the malleability of intelligence through learning.

On the other hand, Azerbaijani students were more intolerant of uncertainty and ambiguity. They tended to seek predictability and clarity, potentially rendering intelligence the primary coping mechanism for reducing uncertainty. Thus, the higher the need to reduce uncertainty, the more likely it is viewed as a resource that can be used to achieve this goal.

4.4 Relationships among implicit theories, attitudes towards uncertainty, and academic achievement

We suggest that the obtained pattern of results is indicative of the general representation of uncertainty being more conducive of learning in Russian compared to Azerbaijani students. This argument is based on the observation that Russian students had higher levels of mastery goals, academic self-concept, and academic achievement, than Azerbaijani students. We also obtained a positive correlation between academic achievement and tolerance for ambiguity in both samples. Thus, we argue that attitudes uncertainty play a role in learning and academic achievement: The readiness to cope with ambiguity and complex situations promotes learning outcomes.

In the Azerbaijani sample, we obtained several correlations that were absent in the Russian sample. Two of them also reflected the relationship between learning outcomes and attitudes towards uncertainty. Azerbaijani students with higher academic achievement demonstrated lower intolerance for ambiguity and lower intolerance for uncertainty in interpersonal relationships. This pattern also speaks in support of the importance of representing uncertainty in learning. In combination with high intolerance for uncertainty in the Azerbaijani sample, it suggests that cultural attitude towards uncertainty moderates self-regulated learning. Because of this moderating effect, learning requires more personality 'resources' to cope with challenges in learning in the Azerbaijani sample, and that is reflected in additional relationships observed for academic achievement and personality traits.

The only result that contradicts our hypotheses was the negative relationship between academic achievement and the enriched implicit theory of personality in the Azerbaijani sample. Thus, in this sample, students with high academic achievement were more likely to be entity rather than incremental theorists. These students also showed higher mastery goals that were in turn positively related to the enriched implicit theory of personality. These inconsistencies suggest the existence of additional constructs that mediate and/or moderate relationships between implicit theories, mastery goals, and academic achievement [36]. Future studies will benefit from considering these additional factors.

Thus, we suggest that the Western education system requires a tolerant attitude towards uncertainty due to the necessity to cope with learning challenges inherent to the very process of education [13]. Learning can be considered as the ecological situation of the evolution of such tolerance. The learning process can be viewed as a way to decrease cultural uncertainty avoidance that should in turn lead to the economic and cultural progress. According to this view, education in general might benefit from nurturing the development of positive representations of uncertainty in students and setting explicit aim of developing a tolerant attitude towards uncertainty, which should be especially beneficial in cultures with high uncertainty avoidance.

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