

## Relationship between epistemological beliefs and motivational orientation among high school students<sup>1</sup>

Nataša Simić, Ljubomir Savanović, and Tijana Jokić

*Faculty of Philosophy, University of Belgrade, Serbia*

Relationship between epistemological beliefs and motivational orientation of high school students was studied and their relationship with school majoring, GPA and gender. To estimate epistemological beliefs and motivational orientation Schommer's Epistemological Questionnaire (EQ) and Work Preference Inventory (WPI) were used. Through factor analysis of EQ 5 factors were extracted, that differ from those Schommer singled out. Negative correlation between naive epistemological beliefs on one side, and intrinsic ( $-0.327$ ,  $p < 0.01$ ) and general motivation ( $-0.247$ ,  $p < 0.01$ ) on the other, was determined. Students majoring in social sciences have more mature epistemological beliefs ( $F = 11.278$ ,  $df = 1$ ,  $p < 0.01$ ). Boys have more mature epistemological beliefs than girls only on factor *Avoiding relating, ambiguity and dependence on authority* ( $F = 16.899$ ,  $df = 1$ ,  $p < 0.01$ ). Correlation between epistemological beliefs and GPA was not determined. Students majoring in social sciences have higher level of motivation ( $F = 6.626$ ,  $df = 1$ ,  $p < 0.05$ ). Girls are more motivated by enjoying in what they are doing ( $F = 6.261$ ,  $df = 1$ ,  $p < 0.05$ ).

Keywords: *epistemological beliefs, motivation, students, gender, GPA*

Two independent research directions have been dominating educational psychology for a long period of time – one was dealing with academic cognition, previous knowledge and learning strategies, and the other – with emotions and motivation. It has been recently, during the 80's, that researchers have brought these two directions together and began to study relationship between cognition and school learning, on one side, and motivation, on the other (Pintrich, 2003). Many studies that followed lead to valuable insights when it comes to learning and pointed to numerous possibilities of raising students' achievements through change of practice. This research served to bring us closer to understanding relationship between students' epistemological beliefs and motivation, to determine whether certain beliefs and motivational orientation are related to school achievement, majoring and gender.

---

1 This work was supported by the Ministry of education, science and technological development of the Republic of Serbia, grant number 179018.

Corresponding author: nsimic@f.bg.ac.rs

### **Epistemological beliefs**

While epistemology, as a branch of philosophy, deals with origin and structure of knowledge, researchers within psychology, on the other hand, are mainly interested in personal epistemologies and beliefs, personal representations about nature of knowing and learning (Hofer & Pintrich, 2004; Pavlović, 2009; Schommer-Aikins, 2004). Unlike Perry's developmental model, according to which epistemological beliefs represent a single dimension (Perry, 1968, according to Schommer-Aikins, 2004), multidimensional models prevail nowadays (Hofer & Pintrich, 1997; Schommer-Aikins, 2004). Actually there is a consensus that people have a system of independent beliefs about different aspects of knowing and learning that differ according to the level of their development (naive to sophisticated) which can also be determined by quantitative methods. There are debates regarding the question whether beliefs about nature of learning can be considered as epistemological beliefs. In this paper we lean on to work of Schommer, who says that beliefs in innate ability, quick learning, simple knowledge and certain knowledge can be considered as epistemological beliefs, because we find beliefs about knowledge inseparable and interrelated with beliefs about learning and knowing.

Another question that is raised in the area of epistemological beliefs is whether they are general or specific. Majority of researchers consider them as specific for a particular domain and common conclusion could be that students of "soft" sciences have stronger beliefs in uncertainty of knowledge than students of "hard" sciences, and also that lots of effort has to be invested in order to learn something (Bråten & Strømsø, 2005; Chai, Khine, & Teo, 2006; Dahl, Bals, & Turi, 2005; Greene, Torney-Purta, & Azevedo, 2010). In this paper we relied on arguments in favor of beliefs being specific for a particular domain. What we also took into consideration are different tenets, data collection methods and procedures of data analyses in humanities, science and art, for example.

Numerous studies showed that epistemological beliefs are significant factors that determine school achievement. They also showed that they are related to cognitive styles, different sociodemographic variables and motivation.

It has been shown that students with naive beliefs about knowledge (in innate ability, quick learning, simple knowledge and certain knowledge) hardly understand complex texts and give up on complex tasks easily (Schommer-Aikins, 2004); they also have tendency to avoid obstacles and consequently they express maladaptive behavior and have low achievement (Qian & Alvermann, 2000). Those students are satisfied with the first information they obtain and do not explore other sources (Tolhurst, 2007). Additionally, they rarely employ critical thinking strategies, metacognitive and self-regulation strategies (Dahl et al., 2005; Kizilgunes, Tekkaya, & Sungur, 2009; Paulsen & Feldman, 2005; Phan, 2008; Rodriguez & Cano, 2006) which leads to lower academic achievements (Greene et al., 2010).

Studies that dealt with gender differences showed that men have stronger beliefs in independent knowing and learning, that is characterised by objectivity,

analysis, and that aims at convincing, unlike women who have stronger beliefs in interrelated knowing and learning characterized by empathic understanding. Schommer documented that men have more naive beliefs about learning speed and stability of abilities (Schommer, 1993). Moreover, similar results are shown in another study – male students have more naive beliefs about abilities, possibilities to learn and complexity of knowledge than their female colleagues (Marzooghi, Fouladchang, & Shemshiri, 2008).

### **Motivational orientation**

Motivation can be defined as a driving force that triggers an individual to act. Questions like why people start doing something or how they make their choices, what enables them to endure and finish a task can be answered and explained by motivation (Pintrich, 2003). Usually, motivation is divided to intrinsic and extrinsic motivation (Deci, 1971; Woolfolk, 2010). Intrinsic motivation directs person to engage himself into a work because they found it interesting, challenging, fulfilling. Extrinsic motivation does not imply a person enjoying in a work itself, but because of rewards that follow (Amabile, Hill, Hennessey, & Tighe, 1994; Woolfolk, 2010). These two orientations shouldn't be seen as mutually exclusive. They are two separate and independent dimensions that are slightly positively correlated, as determined recently (Herbert, Craven, McInerney, & Debus, 2000; Lepper, Henderlong Corpus, & Iyengar, 2005). Students usually want to broaden their knowledge in some area of their interest, but at the same time they want to get as highest marks as possible so to demonstrate their competencies. Amabile and her associates (1994), guided by the idea about coexistence and interaction of intrinsic and extrinsic motivation, suggested four subdimensions of these two types of motivation: enjoyment, challenge, compensation and outward (direction towards acknowledgement and receiving directions from others).

Abundance of studies within educational psychology dealt with relationship between motivation and achievement; then, gender and age differences between motivational orientations.

Number of results point out that intrinsic motivation is strongly correlated with academic achievement (e.g., Gottfried, 1990; Gottfried, Marcoulides, Gottfried, Oliver, & Guerin, 2007; Jovanović, 2011; Kizulgunes et al., 2009; Pintrich, 2003), but when it comes to extrinsic motivation results are ambiguous. Some results show that extrinsic motivation is positively correlated with achievements, but only among older students, whereas correlation is negative among younger students (Lepper et al., 2005).

When it comes to gender differences, girls are motivated more often by striving for development and learning, unlike boys who are often motivated by achievement. Niemivirta (1997) conducted a research and documented that boys, although they had greater self-esteem and more positive self-expectations,

were driven towards achievement and used mostly superficial learning strategies compared to. Studies of Marcon (1999) and Martin (2004) confirmed that girls are intrinsically motivated more than boys, that they use cooperative strategies and that they assign achievement to their effort. On the other hand, boys are more prone to using competitive strategies and to assigning achievement to their abilities. However, anxiety influences girls' motivation for learning and consequently achievement.

Developmental and longitudinal studies revealed an interesting regularity when it comes to students' motivation. There is a decrease in intrinsic motivation at the end of primary school and at the beginning of high school education. This refers to academic motivation, since motivation for extracurricular activities has not shown such a decrease (Lepper et al., 2005). Student of that age confront their parents, friends, they need to accept their bodies and develop personal identity, which altogether lead to lower energy and motivation for learning (Hofer & Peetsma, 2005). Some authors point out that students at this age tend to prove and demonstrate their abilities and competencies, which leads to increased motivation for achievement and therefore lower motivation for academic development (Zanobini & Usai, 2002).

## RESEARCH PROBLEM AND OBJECTIVES

Determining relationship between epistemological beliefs and motivational orientation is of great significance for this paper. Studies showed that students with sophisticated epistemological beliefs are mainly intrinsically motivated and directed to personal development (Bråten & Strømsø, 2005; Kizilgunes et al., 2009). However, this correlation is not always unambiguous; it is more likely that different dimensions of epistemological beliefs are differently related to students' motivation. Therefore, it is interesting to determine nature and intensity of this correlation within our sample, especially to determine differences between students majoring in science and social sciences, between students of different Grade point averages (GPA) and also to determine gender differences on formerly mentioned dimension.

### **Method**

*Sample.* Research was conducted in 5 Belgrade High schools. Participants were 153 second grade students. Number of classes majoring in science and social sciences was equal. Due to the fact that classes majoring in science consisted of greater number of students, those students were involved in bigger number than students majoring in social sciences (59.5% and 40.5%). Beside this, there have been more female (54.9%) than male (45.1%) participants, which is adequate reflection of gender distribution in high schools. As a measure of achievement we took GPA at the end of the first semester since it is presumed to indicate achievement in school better than GPA at the end of the year. We classified GPA in 5 categories according to usual GPA categorization – not passing, passing, good, very good and excellent. Our sample

consisted mainly of students with very good GPA (59.5%), also it didn't include students with "passing" GPA. Frequencies of students in 4 categories are shown in Table 1 as well as their distribution according to their major.

Table 1. *Frequencies of students according to their gender, major and GPA at the end of the first semester*

GPA	Major				Total
	Science		Social sciences		
	m	f	m	f	
Not passing	7	5	6	5	23
Good	2	2	3	2	9
Very good	30	21	10	30	91
Excellent	10	14	1	5	30
Total	49	42	20	42	153

Two questionnaires, translated from English to Serbian by two independent interpreters have been used for this research.

To estimate epistemological beliefs Schommer's questionnaire was used – *Epistemological Questionnaire – EQ*, which consist of 63 items, classified in 12 subtests (Schommer, 1990). Through determining factor structure of this questionnaire on our sample, 5 factors that differ from those Schommer singled out were extracted (factors will be described and interpreted in the section Results). For each participant 5 scores were calculated (through counting raw scores on items that belong to subtests that are grouped in a factor which were then divided by number of items.). By calculating average of those 5 factor scores, measure of maturity of epistemological beliefs was obtained (total score, theoretical range from 1 to 5). Same as in Schommer's work, higher total scores (as well as factor scores) pointed to more naive epistemological beliefs, and lower scores to more mature beliefs. In Table 2, we can see minimum and maximum values for this scale, mean value, standard deviation, and reliability that is somewhat low, which is in accordance with results of other authors (Teo & Chai, 2011).

To estimate motivational orientation we used Work Preference Inventory (*WPI*; Amabile et al., 1994), which consists of 30 items. During questionnaire development, authors extracted 2 factors which they called intrinsic and extrinsic motivation. Afterwards, factor analysis was performed on each scale in order to determine whether meaningful subfactors, that would enable more sophisticated analysis, can be singled out. Eventually 2 subfactors on each scale were extracted – on Intrinsic motivation – Enjoyment (e.g. "I enjoy doing work that is so absorbing that I forget about everything else") and Challenge ("I enjoy tackling problems that are completely new to me"), and on Extrinsic motivation – Compensation ("I am strongly motivated by the [grades] [money] I can earn") and Outward (oriented towards structures, rewards, and goals established by others – "I'm concerned about how other people are going to react to my ideas").

In this research, scores for each of 4 subfactors were calculated, then, scores for factors (intrinsic and extrinsic motivation) and also general score for motivation (theoretical range from 1 to 5). As we can see in Table 2, distribution is negatively skewed, which points to participants being highly motivated for learning, either intrinsically or extrinsically, or even giving socially desirable answers, which demands carefulness in data interpretation.

Table 2. *Basic descriptive statistic measures of variables included in the research*

Variable	Min	Max	Mean	Standard deviation	Skewnis	Reliability ( $\alpha$ )
Epistemological beliefs	1.54	2.75	2.025	.222	.148	.631
Motivational orientation	2.43	4.24	3.596	.344	-.449	.675

Apart from measures of how sophisticated epistemological beliefs and motivational orientation are, data about gender, high school majoring and GPA were collected.

## Results and discussion

### *Factor analysis of EQ*

Through factor analysis of 12 subscales of EQ, through method of maximum likelihood and Oblimin rotation, 5 factors were extracted (see Table 4) that explain 61.38% of variance in students' scores (see Table 3). Kaiser-Meyer-Olkin measure of sampling adequacy is 0.640 and Bartlett's test of sphericity is significant ( $\chi^2=197.296$ ;  $df=66$ ;  $p<0.001$ ).

Table 3. *Initial eigenvalues and percentage of explained variance in factor analysis of EQ with Oblimin rotation*

Factor	Eigenvalues	Percentage of variance	Cumulative percentage
1	2.212	18.431	18.431
2	1.880	15.669	34.100
3	1.205	10.040	44.140
4	1.049	8.743	52.884
5	1.020	8.498	61.382

Table 4. *Pattern matrix of EQ subscales after Oblimin rotation*

	Factor				
	1	2	3	4	5
Success is not related to hard work	1.009				
Certain knowledge		0.633			
Uncritical attitude towards authority		0.432	0.371		
Searching for unambiguous answers		0.309			
Quick learning			0.621		
Knowledge is obtained at once			0.564		
Focused effort is a waste of time			0.470		
One cannot learn how to learn				0.776	
Learning ability is innate			0.300	-0.355	
Avoiding ambiguity					0.592
Avoiding integration					0.383
Dependence on authority					0.370

Saturations lower than 0.3 are not shown in the table

Referring to table 4, with factor saturations presented, we can see that first factor consists of a subset – *Success is not related to hardwork*, which has not occurred in any of Schommer’s papers yet. It can be explained by belief that success in school or at work does not depend on invested endeavor, but it is still unclear whether it depends on abilities or some outwards circumstances (being lucky, having connections, etc.) or even on combination of these two.

Second factor consist of subsets: Certain knowledge, Uncritical attitude towards authority, Searching for unambiguous answers. It is obvious that it is combination of Schommer’s factor about certainty of knowledge and knowledge structure. A person believes that by learning what scientific authorities propagate they acquire one and only, universal and fixed, unchangeable truth. She has low tolerance for uncertainty, ambiguity and searches for „the most truthful“ solution; has uncritical attitude towards experts’ point of view. This factor can be named *Knowledge is certain and unambiguous, and is uncritically approached*.

Third factor consist of subsets: Quick learning, Knowledge is obtained at once, Focused effort is a waste of time, which is consistent with Schommer’s factor about speed of learning so we can name it *Learning is quick*. It can be described as a belief that knowledge is immediately acquired after the first reading and that repeated reading and further effort can only lead us to confusion.

Fourth factor resembles Schommer’s factor about learning ability, but its meaning is slightly more complex since it includes subsets One cannot learn how to learn and Learning ability is innate, but correlating negatively. By analyzing answer on subset One cannot learn how to learn more closely, it can be concluded that students developed beliefs that learning skills are not that relevant for achievement in school which highly likely to be affected by their experience with teachers in school. Additionally, students believe that they have no control over what they are learning. On the other hand, they do not believe that people are born with highly or less developed abilities for learning. Therefore, this factor can be named *Learning abilities are not innate, but learning how to learn is not quite relevant for success*. Unlike other factors, we cannot claim that higher scores refer to more naive and lower scores to more sophisticated beliefs. It is necessary to take the complexity of this factor into consideration when interpreting it.

Fifth factor includes three subsets: Avoiding integration, Avoiding ambiguity and Dependence on authority. One believes that knowledge is simple and consists of isolated pieces of information and that it is best to acquire it by simply memorizing it. In case one tries to integrate that information in their own way, he or she will come across ambiguities and numerous unclear points which imply asking for solution from authority (a teacher or a parent). Therefore we can name this factor *Avoiding integration, ambiguities and dependence of authority*.

Moderate positive correlation between second and fifth factor ( $r=.336$ ) and weak negative correlation between second and fourth factor ( $r=-.244$ ) were determined, whereas other correlations were lower than .15. According to these findings we believe that the use of oblique rotation (Oblimin) was justified.

*Relationship between epistemological beliefs and motivational orientation*

After determining factors and scores for each participant, we continued with analyzing relationship between epistemological beliefs and 5 extracted factors, on one side, and motivational orientation and its factors (Intrinsic and Extrinsic motivation, Enjoyment, Challenge, Compensation and Outward) on the other. Looking at table 5, we can see negative correlation of low intensity between motivational orientation and epistemological beliefs ( $r=-.247$ ,  $p<.01$ ) – the more naive epistemological beliefs are, the lower motivation for learning and work is. Relationship between intrinsic motivation and sophistication of epistemological beliefs is stronger than correlation with extrinsic motivation, which is in accordance with previous studies (Bråten & Strømsø, 2005; Kizilgunes et al, 2009; Rodriguez & Cano, 2006). Moreover, it can be seen that intrinsic and extrinsic motivation are almost completely independent factors ( $r=.010$ ,  $p>0.05$ ). This result says that these two motivational orientations can give mutual contribution to increasing general motivation for learning. Correlation between subfactors of intrinsic and extrinsic motivation was not statistically significant.

Table 5. *Correlation between students' epistemological beliefs, intrinsic and extrinsic motivation and general motivation*

	Epistemological beliefs	Intrinsic motivation	Extrinsic motivation	General motivation
Epistemological beliefs	1	-0.327**	-0.029	-0.247**
Intrinsic motivation	-0.327**	1	0.010	0.700**
Extrinsic motivation	-0.029	0.010	1	0.721**
General motivation	-0.247**	0.700**	0.721**	1

\*\* significance level 0.01, N=153

After additional analysis of scores calculated for 5 factors at EQ and 4 factors at WPI, we derived other interesting results. Third factor (*Learning is quick*) is negatively correlated with subfactor Enjoyment ( $r=-0.232$ ,  $p<0.01$ ) and fifth factor (*Avoiding integration, ambiguities and dependence of authority*) is negatively correlated with subfactor Challenge ( $r=-0.287$ ,  $p<0.001$ ).

*Relationship between students' epistemological beliefs, motivational orientation and socio-demographic characteristics*

Since one of the goals of this research was to determine potential differences in sophistication of epistemological beliefs and in motivational orientation between students with different majors, results of the Analysis of variance (ANOVA) are presented in the Table 6 – difference between students majoring in science and social sciences is statistically significant when it comes to sophistication of epistemological beliefs. Students majoring in social sciences have more sophisticated beliefs about nature of knowledge in general, especially on dimensions *Certain and unambiguous knowledge that is uncritically approached* (Factor 2) and *Quick learning* (Factor 3).



Beliefs of students from different categories of GPA were compared as well, but no statistically significant differences were obtained.

Comparison of sophistication of epistemological beliefs of male and female participants showed that male students have more mature beliefs about complexity and structure of knowledge, which means that, according to their own claims, they avoid integration, ambiguity and depend on authority less than female students (see Table 6).

Table 6. Means and standard deviations of epistemological beliefs factors and general epistemological beliefs for different categories of variables Majoring and Gender, F ratio and their significance level derived from ANOVA

Factor	Major (Mean and SD)		F (df=1)	Gender		F (df=1)
	Science	Social sciences		Male	Female	
1	2.28 (0.58)	2.18 (0.62)	1.028	2.26 (0.56)	2.22 (0.64)	0.144
2	8.98 (0.93)	8.64 (0.95)	5.016*	8.81 (1.00)	8.87 (0.91)	0.116
3	6.92 (1.29)	6.18 (1.69)	9.321**	6.85 (1.63)	6.44 (1.37)	2.836
4	0.12 (0.99)	0.13 (1.06)	0.007	0.07 (1.11)	0.16 (0.94)	0.273
5	8.44 (1.17)	8.29 (1.27)	0.587	7.95 (1.22)	8.73 (1.10)	16.899**
Total	2.76 (0.20)	2.65 (0.23)	11.278**	2.71 (0.24)	2.72 (0.20)	0.259

\*significance level 0.05; \*\*significance level 0,01; None of Levene's test is significant

By comparing motivational orientation of students with different majors using ANOVA, it has been revealed that students majoring in social sciences are generally motivated more than students majoring in science (see Table 7), which is a consequence of difference between these two groups on Extrinsic motivation, subfactor Outward.

By comparing motivational orientation of students with different GPA we determined statistically significant difference on Extrinsic motivation, on two subfactors – Outward and Compensation, as well as on general motivation (see Table 8). Through analysis of Bonferroni post hoc tests, we gained an insight that students with „very good“ GPA have significantly higher extrinsic motivation than students from „not passing“ and „excellent“ category (see Table 8). When it comes to differences on subfactors, „very good“ students are more motivated by competing and gaining acknowledgments than „excellent“ students, on one hand, and by rewards and ratings compared to „not passing“ students. When general motivation is taken into consideration, „good“ students are motivated stronger than „not passing“ and „excellent“ students.

When it comes to relationship between motivational orientation and gender, results show that girls are more motivated by enjoyment in what they do and by possibility of self-expression and self-enrichment (see Table 7) which is in accordance with most of studies dealing with gender differences in motivation (Martin, 2004; Milojević, Stojiljković, Todorović & Kašić, 2009; Niemivirta, 1997). Differences in other components of motivation have not been found.

Table 7. Means and standard deviations of motivational orientation factors and of general motivation for different categories of variables Majoring and Gender, and F ration and their significance derived from ANOVA

Factor	Majoring (Mean and SD)		F (df=1)	Gender		F (df=1)
	Science	Social sciences		Male	Female	
Enjoyment	4.22 (0.47)	4.35 (0.43)	2.960	4.17 (0.49)	4.35 (0.41)	6.261*
Challenge	3.23 (0.76)	3.20 (0.66)	0.079	3.32 (0.72)	3.14 (0.71)	2.475
Outward	3.09 (0.45)	3.39 (0.57)	12.778**	3.17 (0.51)	3.24 (0.53)	0.595
Compensation	3.61 (0.58)	3.79 (0.64)	3.226	3.67 (0.60)	3.70 (0.62)	0.092
Intrinsic	3.73 (0.48)	3.77 (0.47)	0.376	3.74 (0.49)	3.75 (0.47)	0.000
Extrinsic	3.35 (0.43)	3.59 (0.54)	9.134*	3.42 (0.49)	3.47 (0.49)	0.360
Total	3.54 (0.32)	3.68 (0.36)	6.626*	3.58 (0.38)	3.61 (0.31)	0.187

\*significance level 0.05; \*\* significance level 0,01; None of Levene's test is significant

Table 8. Means, standard deviations and F ratios of motivational orientation factors and general motivation for different levels of variable GPA derived from ANOVA

Factor	GPA (Mean and Standard Deviation)				F (d=3)
	„Not passing“ (N=23)	„Good (N=9)	„Very good“ (N=91)	„Excellent“ (N=30)	
Enjoyment	4.27 (0.37)	4.57 (0.34)	4.26 (0.48)	4.22 (0.48)	1.147
Challenge	3.14 (0.73)	3.63 (0.54)	3.18 (0.69)	3.29 (0.84)	1.288
Outward	3.07 (0.63)	3.43 (0.67)	3.30 (0.45)	2.97 (0.50)	4.442**
Compensation	3.30 (0.66)	3.89 (0.81)	3.81 (0.56)	3.54 (0.54)	5.569**
Intrinsic	3.70 (0.47)	4.10 (0.36)	3.72 (0.46)	3.75 (0.48)	1.887
Extrinsic	3.18 (0.59)	3.66 (0.70)	3.56 (0.43)	3.26 (0.39)	6.397**
General m.	3.44 (0.32)	3.88 (0.29)	3.64 (0.32)	3.50 (0.39)	5.116**

\*significance level 0.05; \*\* significance level 0,01; None of Levene's test is significant

## DISCUSSION AND CONCLUSION

This research confirmed that there is negative correlation between motivation and naivety of epistemological beliefs. The most prominent negative correlation is correlation between intrinsic motivation and naivety of epistemological beliefs, therefore the higher intrinsic motivation is, the more sophisticated epistemological beliefs are, which is in accordance with the results of previous studies (Bråten & Strømsø, 2005; Kizilgunes et al., 2009).

It has been determined that students who believe that knowledge is acquired gradually by reading the literature and by upgrading existing knowledge, enjoy the process of learning and that they prefer to set goals for themselves and organize and plan their studying. Such students are eager to obtain new knowledge and to express themselves because they are aware that it will enrich

their knowledge and personality and also improve their learning skills. On the other hand, students who believe that learning is quick do not enjoy learning process and knowledge construing – it is more likely that they are goal oriented and oriented towards effects of learning rather than the process itself.

Students who believe that knowledge is complex are often inspired by challenging tasks and testing their own intellectual limits. They are characterized by independence and courage to deal with composite problems and they also structure their knowledge according to their principles, without having to rely on the authority. They are tolerant of uncertainty, they are challenged by ambiguity and they are motivated by searching for problem solutions and overcoming it so as to broaden their knowledge and skills. On the other side, there are students who do not perceive learning as a challenge since „knowledge is very clear, precise and consist of isolated pieces of information given by respective authorities“.

It is concluded that intrinsic and extrinsic motivation are two independent constructs. Therefore, students can be highly motivated both intrinsically and extrinsically. This finding is in accordance with results of foreign studies as well as with everyday experience that students want to broaden their knowledge and make it more profound while at the same time they also want to demonstrate their competences (Lin & McKeachie, 1999).

Comparing students majoring in science and social science it has been found that „social scientists“ have more mature system of epistemological beliefs, what was determined in several previous studies, as well (Bråten & Strømsø, 2005; Chai et al., 2006; Dahl et al., 2005; Greene et al., 2010). Students majoring in science, who are mostly engaged in exact matters where the goal is usually to find one precise solution by following set of rules and laws, are more prone to perceive knowledge as unambiguous and to see truth as unchangeable and distinct. It is highly likely that, thanking to their talent for science, they understand the matter „at once“and believe that knowledge in general is not gained through repeating and rehearsing. Unlike them, „social scientists“ concluded that lots of effort should be invested, that learning is slow process of knowledge upgrading and that in most cases there are no clear-cut solutions and absolute answers.

Sophistication of epistemological beliefs of students with different GPA was compared and none of the differences are significant. This result might seem rather unusual since previous studies suggested correlation between GPA, epistemological beliefs and learning strategies (Dahl et al., 2005; Greene et al., 2010; Kizilgunes, et al., 2009; Paulsen & Feldman, 2005; Phan, 2008; Qian & Alvermann, 2000; Rodriguez & Cano, 2006; Schommer-Aikins, 2004). It is possible that this research, unlike those conducted in other countries, hasn't shown positive correlations because students included in the sample were younger than college students included in previous studies. It is probable that the reason for those differences lies in complexity of the matter college students deal with. Also, college professors insist more on comprehension and application of

knowledge so marks are also formed by beliefs about knowledge and learning, as well as learning strategies. Besides this, we have to be careful when interpreting these data since number of students in some GPA categories is rather small. Consequently, we find relationship between epistemological beliefs, learning strategies, metacognitive strategies and cognitive styles quite significant topic to explore in order to reach the best understanding of the dilemma – whether epistemological beliefs affect our learning and therefore GPA or GPA in our schools is not adequate indicator of students' knowledge.

Comparing students by gender, we saw that boys have more mature epistemological beliefs about knowledge complexity and structure, which is opposite to Schommer's (Schommer, 1993) findings that girls have more mature epistemological beliefs about learning speed and variability of abilities. However, we can say that our findings are in accordance with Belenky's results up to a point. Belenky and her associates (Belenky, Clinchy, Goldberg, & Tarule 1999) stated that women at younger age are less independent and have more trust in authorities. Differences can be explained by cultural factors such as low rating of autonomous parenting style in our country when comparing to other countries in Europe (Pavlović, 2010), especially when it comes to girls. Girls are expected to be quite calm and obedient unlike boys who are seen as rebels and supported to demonstrate their independence and assertiveness (Hofstede, 1980). It would be interesting to check in future studies whether this difference disappears at older age, i.e. whether women gain greater self-confidence as their education continues and consequently more „courage“ to bring the authority into question.

By looking at students' scores on intrinsic and extrinsic motivation we can see that students majoring in social sciences are significantly more extrinsically motivated, but on the other hand they are not any less intrinsically motivated. „Social scientists“ are more motivated by showing their competences to others and getting their appraisals than „scientists“ are. This can be explained by their greater appreciation of others and seeing them as more important for their future careers that include working with and depending on people. For students majoring in social sciences it is very important to stay „sensitive“ to social climate and to be flexible and adjustable so as to be successful at their future work places.

Although number of students in different categories of GPA is small, it is necessary to point out some interesting insights about relationship between motivation and GPA. Factor Outward is higher among „very good“ than „excellent“ students, as well as factor Compensation which is more salient than among „not passing“ students. If we consider these differences between „excellent“ and „very good“ students we might come to conclusion that the best students are more self-confident which enables them to be less dependent on other people's reactions. On the other hand, by comparing „very good“ and „not passing“ students, we might conclude that „not passing“ students are less motivated by grades, so punishing them with bad marks won't affect them as much as it would „very good“ students, who are probably more influenced by their surrounding's reactions to low GPA. This result that „good“ students

are generally more motivated than „excellent“ and „not passing“ students is probably a consequence of their tendency to achieve what „excellent“ students have already achieved (and therefore are not motivated as much) and what „not passing“ students are far from (and therefore are not motivated as much).

When it comes to gender differences in motivation it has been confirmed that girls are rather oriented to tasks and satisfaction they get from solving them. On the other hand, previous results that boys are more oriented towards reward and acknowledgements (e.g., Niemivirta, 1997) have not been confirmed. It remains an open question whether differences between boys and girls, when it comes to extrinsic motivation, are not significant due to our female participants being more extrinsically motivated than those in foreign studies or boys in our sample are not motivated by proving themselves in school as much as in some other contexts.

Taking finding from this research into consideration it can be concluded that teachers should stimulate their students to foster development of sophisticated epistemological beliefs, especially among students majoring in science and females. It would be useful if teachers structure their lectures in a manner that supports critical thinking, searching for alternative ways of different problems' solving and independence of authority, last being of particular importance for girls raised in the patriarchal context. Teachers should point to the significance of the learning process, i.e. perseverance when learning and importance of tolerance of uncertainty while trying to construct knowledge.

Concerning learning motivation, teacher should foster development of the self-regulation skills among students and readiness to take control over learning. Additionally, while striving to raise student motivation, teachers should pay attention to different kinds of motivation among students of different gender and with different majors and GPAs. Since it was obtained that boys are less intrinsically motivated than girls, it would be beneficial if teachers bolster intrinsic motivation among male students through the use of creative teaching techniques and providing examples that are appealing to boys. Having presented results in mind, teachers should expect that overt praising, comparison with peers or public presentation of individual works are more powerful motivational “tools” for student majoring in social sciences than for those majoring in science. Praising would not have such a positive effect on “excellent” students as it would have on “very good” students, whereas threatening and punishing with bad marks would not be as effective to “not passing” students as it would be to “very good” students.

## REFERENCES

- Amabile, M. T., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The Work Preference Inventory: Assessing Intrinsic and Extrinsic Motivational Orientations. *Journal of Personality and Social Psychology*, 66(5), 950–967. DOI: 10.1037/0022–3514.66.5.950.
- Belenky, M., Clinchy, B., Goldberg, N., & Tarule, J. (1999). Women's Way of Knowing. *New Directions for Student Services*, 88.

- Bråten, I., & Strømsø, H. (2005). Predicting Achievement Goals in Two Different Academic Contexts: A longitudinal study. *Scandinavian Journal of Educational Research*, 50(2), 127–148. DOI: 10.1080/00313830600575932.
- Chai, C. S., Khine, M. S., & Teo, T. (2006). Epistemological beliefs on teaching and learning: a survey among pre-service teachers in Singapore. *Education Media International*, 43(4), 285–298. DOI: 10.1080/09523980600926242.
- Dahl, T., Bals, M., & Turi, A. L. (2005). Are students beliefs about knowledge and learning associated with their reported use of learning strategies?. *British journal of educational psychology*, 75, 257–273. DOI: 10.1348/000709905X25049.
- Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of personality and social psychology*, 18, 105–115. DOI: 10.1037/h0030644.
- Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology*, 82(3), 525–538. DOI: 10.1037/0022-0663.82.3.525.
- Gottfried, A. E., Marcoulides, G. A., Gottfried, A. W., Oliver, P. H., & Guerin, D. W. (2007). Multivariate latent change modeling of developmental decline in academic intrinsic math motivation and achievement: Childhood through adolescence. *International Journal of Behavioral Development*, 31(4), 317–327. DOI: 10.1177/0165025407077752.
- Greene, J. A., Torney-Purta, J., & Azevedo, R. (2010). Empirical evidence regarding relations among a model of epistemic and ontological cognition, academic performance, and educational level. *Journal of educational psychology*, 102(1), 234 – 255. DOI:10.1037/a0017998.
- Herbert, M. W., Craven, R. G., McInerney, D., & Debus, R. L. (2000). *Evaluation of the Big-Two-Factor Theory of Motivation Orientations: An Evaluation of Jingle-Jangle Fallacies*. Paper presented at the Annual Meeting of American Educational Research Association, New Orleans, LA.
- Hofer, M., & Peetsma, T. (2005). Societal values and school motivation. Students' goals in different life domains. *European Journal of Psychology of Education*, XX(3), 203–208. DOI:10.1007/BF03173552.
- Hofer, B., & Pintrich, P. (1997). The Development of Epistemological Theories: Beliefs about knowledge and knowing and their relation to learning. *Review of educational research*, 67(1), 88–140. DOI: 10.3102/00346543067001088.
- Hofer, B., & Pintrich, P. (2004). *Personal epistemology: the psychology of beliefs about knowledge and knowing*. New Jersey: Lawrence Erlbaum Associates.
- Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Newbury Park, CA: Sage.
- Jovanović, V. (2011). Faktori napredovanja na testu čitalačke pismenosti [Factors of progress in reading literacy test]. *Psihološka istraživanja*, XIV(2), 135–155.
- Kizilgunes, B., Tekkaya, C., & Sungur, S. (2009). Modeling the relations among students' epistemological beliefs, motivation, learning approach, and achievement. *The Journal of educational research*, 102(4), 243–255. DOI: 10.3200/JOER.102.4.243–256.
- Lepper, M. R., Henderlong Corpus, J., & Iyengar, S. S. (2005). Intrinsic and Extrinsic Motivational Orientations in the Classroom: Age Differences and Academic Correlates. *Journal of educational psychology*, 97(2), 184–196. DOI: 10.1037/0022-0663.97.2.184.
- Lin, Y., & McKeachie, W. J. (1999). *College Student Intrinsic and/or Extrinsic Motivation and Learning*. Paper presented at the Annual Conference of the American Psychological Association, Boston, MA.
- Marcon, R. (1999). *Demographic and Educational Influences on Academic Motivation, Competence, and Achievement in Minority Urban Students*. Poster presented at the Biennial Meeting of the Society for Research in Child Development, Albuquerque, NM.
- Martin, A. J. (2004). School motivation of boys and girls: Differences of degree, differences of kind, or both?. *Australian Journal of Psychology*, 56(3), 133–146. DOI: 10.1080/00049530412331283363.

- Marzooghi, R., Fouladchang, M., & Shemshiri, B. (2008). Gender and grade level differences in epistemological beliefs of Iranian undergraduate students. *Journal of Applied Sciences*, 8(24), 4698–4701. DOI: 10.3923/jas.2008.4698.4701.
- Milojević, M., Stojiljković, S., Todorović, J., & Kašić, K. (2009). Ciljevi postignuća i perfekcionizam gimnazijalaca [Achievement goals and perfectionism of high school students]. *Psihologija*, 42(4), 517–534. DOI:10.2298/PSI0904517M.
- Niemivirta, M. (1997). *Gender differences in motivational-cognitive patterns of self-regulating learning*, Annual Meeting of the American Educational Research Association, Chicago, IL.
- Paulsen, M. B., & Feldman, K. A. (2005). The conditional and interaction effects of epistemological beliefs on the self-regulated learning of college students: Motivational strategies. *Research in higher education*, 46(7), 353–401. DOI: 10.1007/s11162–004–6224–8.
- Pavlović, J. (2009). Prikaz istraživanja ličnih epistemologija: Analiza istraživačkih metafora [Overview of research of personal epistemologies: Analysis of research methaphors]. *Zbornik Instituta za pedagoška istraživanja*, 41(1), 61–75.
- Pavlović, Z. (2010). Sociodemografski činioci vrednovanja autonomnog i konformističkog vaspitnog stila u Srbiji [Socio-demographic factors of valuing autonomous and conformist education styles in Serbia]. *Zbornik Instituta za pedagoška istraživanja*, 42(1), 56–73.
- Phan, H. P. (2008). Predicting change in epistemological beliefs, reflective thinking and learning styles: a longitudinal study. *British journal of educational psychology*, 78, 75–93. DOI: 10.1348/000709907X204354.
- Pintrich, P. (2003). Motivation and classroom learning. In Reynolds, W. & Miller, G. (Eds.) *Handbook of psychology*. New Jersey: John Wiley & Sons, Inc., Hoboken. doi:10.1002/0471264385.wei0706.
- Qian, G., & Alvermann, D. E. (2000). Relationship between epistemological beliefs and conceptual change learning. *Reading and writing quarterly*, 16, 59–74. DOI: 10.1080/105735600278060.
- Rodríguez, L., & Cano, F. (2006). The epistemological beliefs, learning approaches and study orchestrations of university students. *Studies in Higher Education*, 31(5), 617–636. DOI: 10.1080/03075070600923442.
- Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 82, 498–504. 10.1037/0022–0663.82.3.498.
- Schommer, M. (1993). Epistemological development and academic performance among secondary students. *Journal of educational psychology*, 85, 406–411. DOI: 10.1037//0022–0663.85.3.406.
- Schommer-Aikins, M. (2004). Explaining the epistemological belief system: Introducing the embedded systematic model and coordinated research approach. *Educational psychologist*, 39(1), 19–29. DOI: 10.1207/s15326985ep3901\_3.
- Teo, T., & Chai, C. S. (2011). Confirmatory Factor Analysis of the Epistemic Belief Inventory (EBI): A CrossCultural Study. *The International Journal of Educational and Psychological Assessment*, 9(1), 1–13.
- Tolhurst, D. (2007). The influence of learning environments on students' epistemological beliefs and learning outcomes. *Teaching in Higher Education*, 12(2), 219–233. DOI: 10.1080/13562510701191992.
- Zanobini, M., & Usai, C. (2002). Domain-specific self-concept and achievement motivation in the transition from primary to low middle school. *Educational psychology*, 22(2), 203–217. DOI: 10.1080/01443410120115265.
- Woolfolk, A. (2010). *Educational psychology (11th ed.)*. Columbus, OH: Pearson/Allyn & Bacon.