

Metacognitive Skills and Academic Motivation among University Students: Significance and Relationships

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Abstract

The aim of the present study is to explore the levels and relationship between metacognitive skills and academic motivation among university students. The following two research instruments were used: 1) the Metacognitive Awareness Inventory (Schraw & Dennison, 1994) and 2) a questionnaire assessing the level of academic motivation (Angel Velichkov, 2005). 151 survey participants between the ages of 18 and 56 participated in the study. A larger number of female individuals completed the questionnaires. The predominant profile is of students studying humanities. The factor of the profile of instruction has also been analyzed - the predominant profile is of students studying humanities, mainly psychology and pedagogy. The largest number of students is from Plovdiv University "Paisii Hilendarski". 66% of them are studying in bachelor's and 34% in master's program. Scales relating to declarative and procedural cognition, regulation of cognitive processes, and knowledge of strategies for their regulation were studied. It is hypothesized that there are high levels of regulation of cognitive functions among university students and medium levels of academic anxiety. A correlational analysis was also conducted to establish the relationship between the two constructs. No statistical significant correlational dependencies were found. Higher levels of metacognitive awareness were associated with higher levels of academic motivation. The results confirm the importance of forming and developing cognitive skills for carrying out a qualitative educational process, as well as for reducing high levels of anxiety related to academic achievements. Metacognitive awareness is a skill necessary to carry out an effective educational process. The development of skills to manage and guide cognitive processes is associated with the acquisition of competencies applicable to every area of an individual's life.

Keywords: *metacognitive skills, academic anxiety, regulation*

1. Introduction

We live in a world of constant change. The immense variety of forms, colors, and nuances often hinders dedication to a specific activity or sphere of daily life. Awareness in everyday life can be part of the educational process, which in turn is linked to the continuously evolving sciences. Metacognitive awareness can be defined as the ability to understand and regulate cognitive processes in every aspect of human life (Schraw, 2001).

2. Theoretical Perspectives

2.1. Metacognitive awareness

The formation of cognitive skills is a process that encompasses abilities for planning, writing skills, and information processing (Ramadhanti et al., 2021). Metacognitive skills are associated with thinking about the process of thinking itself and decision-making, which in turn requires introspection (Çini et al., 2023). Although metacognitive skills have an individual character, they cannot be considered outside of interpersonal relationships. Several levels of metacognitive awareness can be identified (Çini et al., 2023):

- 1) Individual level – includes the executive skills of the individual;
- 2) Social level – interactions with others are a fundamental factor in the development of metacognition (Taub et al., 2021);
- 3) Environmentally related level – the environment is associated with the formation of learning habits and the acquisition of models for processing information.

Several contemporary studies indicate that metacognitive awareness is an integral part of the learning process, and most importantly, it serves as a key component for forming and understanding learning strategies (Räisänen et al., 2020; Tuononen et al., 2019)

Schraw and his colleagues describe two dimensions of cognitive awareness (Schraw & Dennison, 1994; Kallio et al., 2018):

- Knowledge about cognition;
- Regulation of cognition.

Knowledge about cognition is more of a declarative knowledge, i.e., knowledge about facts (Tuononen et al., 2023). Declarative knowledge is part of long-term memory, where information about acquired knowledge is stored.

The regulation of cognition is related to skills for planning and monitoring the process of performing a given activity (Schraw & Dennison, 1994). These two dimensions cannot be considered independently of each other.

Metacognitive awareness can also be viewed through the lens of problem-solving skills (Mostowf et al., 2023). They include both assessment of future knowledge and retrospective evaluation of past performance (Le Berre et al., 2016).

Metacognitive skills are necessary to achieve greater engagement of learners in this process, which can lead to effective results (Abdelrahman, 2020).

2.2. Academic motivation

Academic motivation can be examined in three dimensions: 1) "Want-to", 2) "Have-to", and 3) lack of motivation (Alhadabi et al., 2023). They are also part of the self-determination theory (Ryan & Deci, 2017). Intrinsic motivation expresses the idea that an activity is performed because of personal satisfaction and the meaning found in it. Extrinsic motivation is externally determined. Lack of motivation indicates a reluctance to engage in any activity. All of this can be related to basic needs for competence, autonomy, and relatedness (Deci & Ryan, 2000). Motivation also includes components such as persistence in pursuing goals, self-control, and resilience. Academic motivation is necessary for success in the educational process (Villalustre et al., 2024). The habits and skills formed in high school should be realized in university. The choices made and the efforts invested are also related to the readiness for certain behaviors in which the individual engages.

Academic motivation can also be examined in the context of life satisfaction (Chen et al., 2023). In this sense, it serves as a driving force for the efforts that students are willing to exert in pursuing their goals at university. High levels of life satisfaction can be associated with persistence in

achieving success, as well as with reinterpreting failure from several different perspectives. Such cognitive regulation also influences the skills for planning activities, engagement, and dedication to them.

The present study:

By setting achievable and realistic goals, students exert more effort to achieve the desired results (Urban et al., 2021). It is necessary to conduct a more detailed and in-depth study regarding the relationship between levels of metacognitive awareness and academic motivation among students pursuing Bachelor's and Master's degrees. In the present study, it is expected that higher levels of cognitive regulation are associated with high levels of academic motivation. The aim of the present study is to trace the levels of metacognitive awareness and academic motivation among students at the Bachelor's and Master's degree levels.

3. Method

3.1. Participants

The total number of participants in the present study is 150 individuals. 92.7% of them are female, while 7.3% are male. They range in age from 18 to 56 years old. All are enrolled in universities in various cities in Bulgaria. At the time of the study, 66.3% of participants are pursuing Bachelor's degrees, while 33.7% are pursuing Master's degrees. The highest percentage of participants are studying humanities (81.6%), followed by technical specialties (17.7%), with one participant studying medicine (0.7%). Participation in the study is voluntary.

3.2. Tools

3.2.1. Metacognitive Awareness Inventory

The questionnaire "Metacognitive Awareness Inventory (MAI), Schraw & Dennison (1994)" is used to investigate the two main levels of metacognitive awareness: **knowledge** (17 items) and **regulation** (35 items). The methodology consists of 52 statements rated on a Likert scale. Knowledge is associated with the deliberate use of strategies in the learning process with the purpose to achieve optimal results. Regulation pertains to students' awareness of employing strategies and their ability to monitor the effectiveness of these strategies.

Knowledge includes five subscales: 1) declarative knowledge, 2) procedural knowledge, and 3) conditional knowledge. The scale for declarative knowledge consists of 8 items; the scale for procedural knowledge comprises of 4 items; and the scale for conditional knowledge contains 5 items. Regulation is investigated across four subscales: 1) planning, 2) understanding the monitoring process, 3) purposeful management of learning strategies, 4) Debugging Strategies, and 5) evaluation. The first two subscales consist of 7 items each. The third subscale contains 10 items, while the fourth and fifth subscales include 5 and 6 items respectively.

3.2.2. Academic Motivation Questionnaire

Angel Velichkov's Academic Motivation Questionnaire consists of 11 items, 7 of which reflect high academic motivation and 4 of which reflect the opposite.

4. Result Analysis

The analysis of the results was conducted using the SPSS 27 Software. Descriptive statistics were analyzed, as well as correlation analysis between levels of metacognitive awareness and academic motivation.

4.1 Descriptive statistics

Table 1 presents descriptive statistics for the factors of gender and age.

		Statistics			
		Gender	Age	Education	Educational profile
N	Valid	150	150	150	140
	Missing	0	0	0	10
Mean		1,93	31,71	1,33	2,86
Std. Error of Mean		,021	,821	,039	,049
Median		2,00	32,00	1,00	3,00
Mode		2	20	1	3
Std. Deviation		,262	10,054	,473	,582
Variance		,068	101,078	,224	,339
Skewness		-3,307	,266	,714	-1,308
Std. Error of Skewness		,198	,198	,198	,205
Kurtosis		9,054	-1,089	-1,510	4,767
Std. Error of Kurtosis		,394	,394	,394	,407
Minimum		1	18	1	1
Maximum		2	56	2	5
Percentiles	25	2,00	21,00	1,00	3,00
	50	2,00	32,00	1,00	3,00
	75	2,00	39,00	2,00	3,00



Tables 2, 3, 4, and 5 include the frequency characteristics of participants – gender, age, education, and university education profile.

Table 2. Distribution of participants by *gender*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	11	7,3	7,3	7,3
	Female	139	92,7	92,7	100,0
	Total	150	100,0	100,0	

From the presented data, it becomes clear that the number of individuals of female gender is significantly higher than the number of individuals of male gender.

Table 3. Distribution of participants by *age*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18	2	1,3	1,3	1,3
	19	8	5,3	5,3	6,7
	20	20	13,3	13,3	20,0
	21	14	9,3	9,3	29,3
	22	4	2,7	2,7	32,0
	23	3	2,0	2,0	34,0
	24	3	2,0	2,0	36,0
	25	1	,7	,7	36,7
	26	2	1,3	1,3	38,0
	27	2	1,3	1,3	39,3
	28	3	2,0	2,0	41,3
	30	6	4,0	4,0	45,3
	31	3	2,0	2,0	47,3
	32	8	5,3	5,3	52,7
	33	3	2,0	2,0	54,7
	34	5	3,3	3,3	58,0
	35	5	3,3	3,3	61,3
	36	4	2,7	2,7	64,0
	37	6	4,0	4,0	68,0
	38	4	2,7	2,7	70,7
	39	8	5,3	5,3	76,0
	40	4	2,7	2,7	78,7
	41	3	2,0	2,0	80,7
	42	5	3,3	3,3	84,0
	43	1	,7	,7	84,7
	44	1	,7	,7	85,3
	45	6	4,0	4,0	89,3
	46	6	4,0	4,0	93,3
	47	2	1,3	1,3	94,7
	48	3	2,0	2,0	96,7
50	1	,7	,7	97,3	
52	2	1,3	1,3	98,7	
54	1	,7	,7	99,3	
56	1	,7	,7	100,0	
	Total	150	100,0	100,0	

The largest number of individuals are 20 years old. Individuals above the age of 44 are the least represented.

Table 4. Distribution of participants by *education*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	In Bachelor's program	100	66,7	66,7	66,7
	In Master's program	50	33,3	33,3	100,0
	Total	150	100,0	100,0	



The majority of participants are enrolled in Bachelor's degree programs, while a smaller portion are enrolled in Master's degree programs. This fact could be a contributing factor to the results showing levels of academic motivation and awareness in the educational process.

Table 5. Distribution of participants by *university education profile*

	Frequency	Percent	Valid Percent	Cumulative Percent
Humanities	114	76,0	81,4	95,7
Technical disciplines	5	3,3	3,6	99,3
Medicine	1	,7	,7	100,0
Total	140	93,3	100,0	
Missing System	10	6,7		
Total	150	100,0		

The predominant profile is of participants studying in humanities specialties; significantly fewer are those who have chosen technical specialties in university. There is only 1 participant studying Medicine.

4.2. Presentation of the results for levels of academic motivation among students

Table 6. Statistics

N	Valid	150
	Missing	0
Mean		24,25
Median		25,00
Mode		26
Std. Deviation		5,194
Variance		26,979
Skewness		-,908
Std. Error of Skewness		,198
Kurtosis		1,072
Std. Error of Kurtosis		,394
Minimum		6
Maximum		33

4.3. A correlation analysis using Spearman's method was conducted on Angel Velichkov's Academic Motivation Questionnaire. The data is presented in Table 7.

Table 7. Correlations

Correlations

		1. I strive to acquire lasting knowledge in all core disciplines.	2. I often seek additional literature on educational topics that interest me.	3. I am determined to achieve high grades in all subjects I study.	4. I strive to study only within the necessary minimum limits.	5. I am not interested in the theoretical details of academic disciplines.	6. I regularly attend all lectures because I find them interesting.	7. When I am not interested, I skip lectures and seminars.	8. Everything we learn here is uninteresting to me, and sometimes I wonder about the purpose of learning.	9. I often seek additional information from the lecturers.	10. I regularly visit the library or search for additional materials on the Internet.	11. I regularly take notes during lectures.	
Spearman's rho	1. I strive to acquire lasting knowledge in all core disciplines.	Correlation Coefficient	1,000	,288**	,210*	-,287**	-,229**	,299**	-,285**	-,196*	,191*	,170*	,274**
		Sig. (2-tailed)	.	,000	,010	,000	,005	,000	,000	,016	,019	,038	,001
		N	150	150	150	150	150	150	150	150	150	150	150
	2. I often seek additional literature on educational topics that interest me.	Correlation Coefficient	,288**	1,000	,211**	-,316**	-,392**	,123	-,216**	-,259**	,382**	,455**	,385**
		Sig. (2-tailed)	,000	.	,010	,000	,000	,134	,008	,001	,000	,000	,000
		N	150	150	150	150	150	150	150	150	150	150	150
	3. I am determined to achieve high grades in all subjects I study.	Correlation Coefficient	,210*	,211**	1,000	-,233**	-,127	,249**	-,139	-,159	,275**	,217**	,189*
		Sig. (2-tailed)	,010	,010	.	,004	,121	,002	,089	,051	,001	,008	,021
		N	150	150	150	150	150	150	150	150	150	150	150
	4. I strive to study only within the necessary minimum limits.	Correlation Coefficient	-,287**	-,316**	-,233**	1,000	,476**	-,206*	,197*	,263**	-,195*	-,304**	-,223**
		Sig. (2-tailed)	,000	,000	,004	.	,000	,011	,015	,001	,017	,000	,006
		N	150	150	150	150	150	150	150	150	150	150	150
5. I am not interested in the theoretical details of academic disciplines.	Correlation Coefficient	-,229**	-,392**	-,127	,476**	1,000	-,129	,184*	,292**	-,257**	-,351**	-,316**	
	Sig. (2-tailed)	,005	,000	,121	,000	.	,116	,024	,000	,002	,000	,000	
	N	150	150	150	150	150	150	150	150	150	150	150	
6. I regularly attend all lectures because I find them interesting.	Correlation Coefficient	,299**	,123	,249**	-,206*	-,129	1,000	-,452**	-,458**	,268**	,135	,294**	
	Sig. (2-tailed)	,000	,134	,002	,011	,116	.	,000	,000	,001	,099	,000	
	N	150	150	150	150	150	150	150	150	150	150	150	
7. When I am not interested, I skip lectures and seminars.	Correlation Coefficient	-,285**	-,216**	-,139	,197*	,184*	-,452**	1,000	,287**	-,188*	-,105	-,274**	
	Sig. (2-tailed)	,000	,008	,089	,015	,024	,000	.	,000	,021	,200	,001	
	N	150	150	150	150	150	150	150	150	150	150	150	
8. Everything we learn here is uninteresting to me, and sometimes I wonder about the purpose of learning.	Correlation Coefficient	-,196*	-,259**	-,159	,263**	,292**	-,458**	,287**	1,000	-,357**	-,213**	-,321**	
	Sig. (2-tailed)	,016	,001	,051	,001	,000	,000	,000	.	,000	,009	,000	
	N	150	150	150	150	150	150	150	150	150	150	150	
9. I often seek additional information from the lecturers.	Correlation Coefficient	,191*	,382**	,275**	-,195*	-,257**	,268**	-,188*	-,357**	1,000	,290**	,213**	
	Sig. (2-tailed)	,019	,000	,001	,017	,002	,001	,021	,000	.	,000	,009	
	N	150	150	150	150	150	150	150	150	150	150	150	
10. I regularly visit the library or search for additional materials on the Internet.	Correlation Coefficient	,170*	,455**	,217**	-,304**	-,351**	,135	-,105	-,213**	,290**	1,000	,220**	
	Sig. (2-tailed)	,038	,000	,008	,000	,000	,099	,200	,009	,000	.	,007	
	N	150	150	150	150	150	150	150	150	150	150	150	
11. I regularly take notes during lectures.	Correlation Coefficient	,274**	,385**	,189*	-,223**	-,316**	,294**	-,274**	-,321**	,213**	,220**	1,000	
	Sig. (2-tailed)	,001	,000	,021	,006	,000	,000	,001	,000	,009	,007	.	
	N	150	150	150	150	150	150	150	150	150	150	150	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).



From the data presented, it is evident that weak correlations are found between the skills of understanding and observing cognitive processes, the skill of planning, and the tendency to seek additional information and literature in the learning process. Declarative knowledge correlates with the effort to take notes in university, the strive for academic success, and the acquisition of lasting knowledge. Conditional knowledge correlates with the tendency to seek additional information on topics that spark students' interest.

5. Conclusions

The present study investigates the levels of cognitive regulation and knowledge among students from Bulgaria, as well as the levels of academic motivation. Several key conclusions can be drawn from the obtained data: 1) there are noticeable gender differences regarding academic motivation. Female participants exhibit higher levels of engagement and motivation for learning compared to males. However, no significant correlation is found between metacognitive awareness and levels of academic motivation; 2) no age differences are identified among students concerning levels of metacognitive awareness and academic motivation.

The results of the study indicate an interest in the material being studied but a lack of additional engagement with materials beyond what is required in university. There is internal self-discipline but without a strong desire for knowledge supplementation and expansion.

No statistically significant demographic influences are observed regarding cognitive regulation and knowledge. Nevertheless, data from Gutierrez de Blume & Montoya (2021) study suggest that the MAI questionnaire can be used as a reliable means of studying students.

The presented data from the study could serve educational purposes. Practices that universities can implement in the education of their students to achieve academic success and a sense of well-being among students can be derived from them. In some already conducted studies, it is shown that students do not have adequate assessment of their cognitive awareness when dealing with problem-solving (Pesout & Nietfeld, 2021; Sidi, Torgovitsky, Soibelman, Miron-Spektor, & Ackerman, 2020; Urban M. & Urban K., 2021). In order to increase levels of cognitive regulation and knowledge, tasks that students could solve in university should stimulate the formation of skills rather than knowledge. Qualitative, not quantitative measurements of learning should be assessed through objective criteria.

5.1. Limitations of the current study and suggestions for future research

The data from the current study are based on a sample with a predominance of female participants (92.7%). Therefore, conducting further research with a more balanced sample is necessary to verify whether the results would be maintained at these levels. The data was collected based on self-reports, which poses a risk of socially desirable responses. This could also be observed through other behavioral and objective criteria to refine the results themselves. Metacognitive awareness can be linked not only to academic motivation but also to other psychological constructs to more accurately account for dependencies influencing the educational process in university.

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