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Academic Self-Efficacy, Approach to Learning and Academic Achievement

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Abstract

In this chapter, we focused on an analysis of relationship between academic self-efficacy (ASE), approach to learning (deep – DA and surface – SA), heteronomous (HAA) and autonomous evaluation (AAA) of academic achievement of adolescents. The purpose of this study is to examine if ASE and approach to learning (DA, SA) predict AAA and HAA of adolescents and if AAA is effective to the ASE. The sample consisted of 457 adolescents (268 girls and 189 boys). We used Morgan-Jinks Student Efficacy Scale. We measured academic achievement by grade point average. Autonomous evaluation of academic achievement was measured by perceived self-evaluation of academic achievement. Approach to learning we measured with The Revised Study Process Questionnaire. Our assumption about the correlation of all variables monitored (only with exception of the surface approach to learning) was confirmed. We have identified that academic self-efficacy, similarly as the preferred approach to learning (deep or surface), constitute an important predictor of heteronomous evaluation of academic achievement, and also that HAA is a significant predictor of AAA, while AAA is an important predictor of ASE in the age cohort of adolescents.

Keywords: heteronomous evaluation of academic achievement (HAA), autonomous evaluation of academic achievement (AAA), academic self-efficacy (ASE), deep approach to learning (DA), surface approach to learning (SA), health

1. Introduction

1.1. School success and academic achievement of adolescents

Adolescence is an extremely important period in the development and socialisation of a person that provides an individual with many life changes and challenges. Many aspects embodied in a school environment, where an adolescent spends significant time, are of protective nature linked with experiencing and behaviour of an adolescent at later stages. School success is one

of them. School success provides a basis for adolescents' subsequent socialisation into adulthood and is an important predictor of many facets in adolescents' life paths. Increased income, health and happiness are only some of the many rewards that await the academically high achievers [1]. The National Youth Risk Behaviour Survey [2] shows that young people (from 9th to 12th grade) who do not have signs of the health risk behaviour have received higher grades than those students in the same age who have manifested some level of the health risk behaviour. In the professional literature [3–6] school success, in the broadest perspective, is perceived as meeting requirements of the society concerning the personality of a pupil/student implemented through a school. Some researches (e.g., see [6]) discuss links between school success and social as well as emotional learning and indicate the fact that in recent years all nations globally face unacceptably high levels of school violence, bullying, truancy, suicides among adolescents and other forms of negative behaviour. According to the authors [6], personal well-being and good relations in a classroom are directly linked with school success. Supporting personal well-being not only decrease the number of cases of depression in childhood, but also enhance school success of students.

Academic achievement is an outcome of the performance that indicates what level of personal and educational goals a student has achieved at school. Schools are primarily focused on cognitive goals (e.g., knowledge, critical thinking) or intellectual domain (e.g., numeracy, literacy, history and science), but academic achievement is a construct with more different domains of learning [7]. In a narrow point of view, academic achievement is the outcome of education as it indicates the extent to which the student, teacher, curricular and indeed the educational institution has achieved the predetermined educational goals [8]. Slavík [9] understood academic achievement as a process of recognising a student's level of knowledge, working and learning activities.

School success in terms of assessment of educational achievements (acquired knowledge, skills and competences) is analysed in the literature also from the perspective of two approaches: heteronomous and autonomous (e.g., see [6, 10]). The heteronomous evaluation of academic achievements (HAA) is thus an evaluation of educational results "from the outside," made primarily by a teacher or other actors in the educational process. A school evaluation expressed with a grade is one of methods of the heteronomous evaluation by a teacher and still remains the most common approach to learning outcomes aiming at the greatest possible objectiveness [6]. In the context of objectivity of the heteronomous evaluation as such (in its diverse forms), we would like to note that in order to evaluate a student's performance, a teacher requires high levels of competences. As one of the most significant characteristics of the heteronomous evaluation as a predictor of school success, in accordance with studies by Lent et al. [11] and Lukášová [5], we consider the method applied to assess education at schools. Evaluation and classification are important parts of the educational process. They provide a student with a feedback and inform about the degree of task completion. A classification serves as an expression of assessment in appropriate grades. Evaluation and classification have motivational and informational components both for a pupil/student and his/her parents and teachers [12]. The heteronomous evaluation of academic achievements by a teacher is linked not only with a student's performance in standard tests for the relevant school subject and year of study, but also with a teacher's consideration for a student, his or her performance and

qualities and thus also with assigning attributes of personality and reasoning linked with a student's performance. Grade point averages (GPA) and standardised test scores have long been considered benchmarks for judging students' academic achievement/success [13–15]. However, equally important are internal characteristics (e.g., self-efficacy, self-evaluation and motivation) that are highly related to academic achievement/success [16–22]. According to Astin's Inputs-Environments-Outcomes model (in Ref. [23]), academic successes based on outcomes are viewed as functions of three sets of elements: (1) inputs (family, demographic characteristics and social experiences of students); (2) environment (people, programs, policies, cultures and experiences of students encounter in college/campus); (3) outcomes (knowledge, skills, competencies, beliefs, attitudes, values, personality characteristics and behaviours as they exist after school). York et al. [24] also argue that the academic success is a multidimensional concept comprising the following dimensions: attainment of learning objectives, acquisition of desired skills and competencies, persistence, school satisfaction, academic achievement and career success (post-college performance).

The autonomous evaluation of academic achievement, in contrast to the heteronomous evaluation, is an expression of a comparison between achieved results and assumed objectives, values or criteria made by a student himself or herself, and thus this is an evaluation "from the inside". The autonomous evaluation is an important factor for experiencing school satisfaction and psychological well-being of a student in school and has a significant motivational component for further acquisition of knowledge, skills and competences with the school environment. It is obvious that the autonomous evaluation of academic achievement is an internal characteristic that is highly related to academic success. College students often make informal evaluations of their own course performance and previous research has shown that the accuracy of these self-evaluations is correlated positively with an actual course achievement [25]. We can associate the autonomous evaluation of academic achievement with a concept of self-assessment. A student's self-assessment can promote an intrinsic motivation, internally controlled effort, mastery of goal orientation and more meaningful learning. A student's self-assessment generally involves learners making judgements about their achievements and the outcomes of their learning [26]. Self-assessment is cyclical process [26, 27] and it is formed as a combination of three sub-processes: self-monitoring, self-evaluation and identification and implementation of instructional correctives as needed [27]. Self-assessment plays a significant role in developing self-perceptions that lead to a greater motivation. It is well established that a student's engagement depends upon student's self-efficacy beliefs [28].

1.2. Academic self-efficacy in context of academic achievement and cognitive health of adolescents

Self-efficacy is a significant element of the self-regulatory human structure. It develops based on personal experiences linked with own successes, but also with observing other people and reflections on their performance and achievements. Self-efficacy is defined as beliefs in one's capabilities to organise and execute the courses of action required to produce a given attainment. Self-efficacy beliefs are self-perceptions of capability influencing how people think, feel, motivate themselves and act [16]. Self-efficacy seems to be crucial in both stages of the self-regulation of health behaviour [29]. High self-efficacy, in addition to higher academic achievement and greater

dedication to work, fosters elimination of unwanted emotional reactions and those students with higher academic self-efficacy experience less stress in school than those students, who doubt in their efficacy and abilities [16].

Within an academic context, self-efficacy is frequently described in terms of academic self-efficacy, which defines a learner's judgements about one's ability to successfully attain educational goals [30]. From the perspective of existing researches, self-efficacy as a significant element of self-regulatory personality is linked with academic achievement [19–21, 31]. A total of 38 research studies found the positive relationship between the self-efficacy and the academic achievements [32].

Academic self-efficacy is a construct which motivates a student's learning through the use of such self-regulatory processes as goal setting, self-monitoring, self-evaluation and strategy use. Past research has consistently shown that students' beliefs about their abilities to successfully perform academic tasks (i.e., academic self-efficacy) predict their actual achievement levels in school [16, 20, 33].

Two decades of research have clearly established the validity of self-efficacy as a predictor of students' motivation and learning [18]. Perceived self-efficacy is positively correlated with a rate at which a student solves tasks in school (arithmetic tasks in mathematics) [34]. Self-efficacy beliefs also affect the self-evaluation and autonomous evaluation standards which students use to judge the outcomes of their self-monitoring (in our research study as AAA). Self-efficacy beliefs also motivate students' use of learning strategies [35]. Self-efficacy of students and their self-confidence associated with learning and performance are crucial for their educational achievement [18]. High academic performance is linked with increased self-confidence and presumably it enhances students to accept greater responsibility for successful completion of tasks [36]. Some authors believe that students with higher self-efficacy achieve higher levels; because they are able to deal with cognitive demands more efficiently [37], attempt to focus on master goals [38], perceive their learning as challenges/tasks that are interesting and valuable and apply reasonable learning strategies [39]. Academic self-efficacy strongly related to performance and adjustment, both directly on academic performance and indirectly through expectations and coping perceptions (challenge-threat evaluations) on classroom performance, stress, health and overall satisfaction and commitment to remain in school [19]. Academic self-efficacy and stress are negatively correlated [21] and academic self-efficacy has also been linked to important nonacademic variables, such as depression and prosocial behaviour [30].

Throughout the school year, students receive a continuous feedback from teachers concerning their school performance. Most commonly this feedback includes grades in a form of aforementioned heteronomous assessment. Having higher self-efficacy students work harder on their educational tasks; they are not afraid of difficult tasks and perceive them as challenges, generally, they are successful and consider eventual failures as accidental or temporary, they use higher cognitive processes, work on their tasks more persistently, longer and more consciously [16, 18, 39] in comparison with students, who have doubts about their abilities and competences and who attribute own successes to sheer luck and experience difficulties in achieving higher educational levels and end up with lower levels of self-efficacy [40].

1.3. Deep and surface approach to learning in context of academic achievement of adolescents

Surface approach to learning is the tacit acceptance of information and memorization as isolated and unlinked facts. It leads to superficial retention of material for examinations and not promotes understanding or long-term retentions of knowledge and information. Biggs [41] argues that the motive (surface motive) that plays a key role in the surface approach is a fear of failure, a student fears that he or she will fail tests or exams, will not learn a given subject on time or will not be able to learn it at all, and thus his or her main motivation is to pass a test or an exam successfully with the minimum effort. A strategy (surface strategy) in the surface approach to learning should be understood as an orientation on an objective set, namely passing the exam. Students with the surface approach to learning are guided rather by external than internal motivations towards learning; they do not distinguish elementary and advanced parts of the curriculum. They understand the curriculum as isolated and mutually unrelated pieces of information, which they are unable to combine and reasonably analyse or synthesise [42, 43]. The problem with their learning is that they do not know how to work with deeper mental operations or choose their learning style (or define which learning style they prefer), and traditional education strengthens this learning strategy among students. As a consequence they learn only formal structures of the curriculum and soon forget even that [44]. The surface learning strategy is a survival technique: a student is simply trying to pass the course with minimal learning [45].

Marton and Säljö [46] first introduced the idea of deep learning. An important deep motive is a genuine internal interest in the curriculum, the subject, when a student searches for relations and logically considers and analyses the studied subject [41, 47]. A deep strategy is to understand the meaning of the curriculum maximally and try to acquire the most comprehensive knowledge and information. Students characterised by this learning strategy apply their knowledge in practice and generally manifest internal motivations towards learning [48]. During the process of acquiring the knowledge, such students divide pieces of information into significant, insignificant, core, additional, develop a structure of the content of the curriculum and apply deeper mental processes [42, 49, 50].

The researchers observed a significant correlation between the deep approach to learning, better academic achievement, high internal motivation, better performance in school [48], self-reflection [51] and higher levels of student self-reported intellectual and personal development [52]. The deep approach to learning has the greatest impact on academic achievement of a student and his or her general success in school. Students who express high academic expectations prefer the deep approach to learning. It seems obvious that application of the surface approach to learning does not support academic achievement of a student. Vrugt and Oort [53] tested a model of efficient self-regulated learning and concluded that using metacognition results in application of the deep approach to learning and consequently in high academic achievement of a student.

In the 3P model, factors on student's side (prior knowledge, ability and their preferred approaches to learning), teaching context (the nature of the content being taught, methods of teaching and assessment, the institutional climate and procedures and so on), on-task approaches to learning

and the learning outcomes, mutually interact, forming a dynamic system, and all of them affects learning of student [47].

In our research, we focused on identification of relation between two intrapsychic factors on a student's side (academic self-efficacy and learning approach) and their academic achievement (heteronomous evaluation of academic achievement and the autonomous evaluation of academic achievement). We assume that the heteronomous evaluation (expressed by GPA and given by a teacher/teachers) significantly affects the autonomous evaluation of academic achievement (expressed in own believes of a student about the knowledge, skills or competence he or she acquired during a school year including own values, priorities and objectives related to learning and education). We assume that academic self-efficacy and approach to learning are significant predictors of heteronomous and autonomous evaluation of academic achievement of adolescents.

2. Methods and procedures

The sample consisted of 457 adolescents studying at secondary schools in the Slovak Republic (268 girls, 189 boys) aged from 15 to 18 years (mean age 16.24). We provide data collected at the end of the 2nd grade in public high schools throughout the nation (end of school year 2015/2016). Students' participation in the research was voluntary (the research battery was administrated personally in 18 high schools). Before administration of research methods, every group of students were given a complete explanation of the research study.

Academic self-efficacy was measured by The Morgan-Jinks Student Efficacy Scale [17], which was designed to acquire information about student efficacy beliefs that is related to school success. The scale consists of 30 items with 3 subscales: talent (15 items), context (9 items) and effort (6 items). All the items are designed using a four-interval scale (from 1 = really agree, 2 = kind of agree, 3 = kind of disagree and 4 = really disagree.). The score for academic self-efficacy was calculated by summing up the scores for the 30 items, after reversing the scores for 9 items (4, 6, 15, 17, 19, 21, 23, 25 and 28). Scores for general academic self-efficacy range from minimum 30 to maximum 120, scores for the talent subscale ranges from minimum 15 to maximum 60, scores for the context subscale ranges from minimum 9 to maximum 36 and scores for the effort subscale range from minimum 6 to maximum 24. The reliability of the scale was Cronbach's $\alpha = 0.687$. The reliability of subscales was: talent: Cronbach's $\alpha = 0.720$, context: Cronbach's $\alpha = 0.601$ and effort: Cronbach's $\alpha = 0.402$.

Heteronomous evaluation of academic achievement (HAA) we measured by GPA in whole study subjects in the end of school year 2015/2016. In the Slovak Republic a student's achievements in individual subjects are measured using the following grades: 1 = excellent, 2 = very good, 3 = good, 4 = sufficient and 5 = poor/unsatisfactory, while the final evaluation in a given subject included in the school report at the end of each school year results from an average of many grades given regularly in relation with achieved results (a teacher can take/takes into account also attributes other than only marks given during the school year). The resulting GPA reflects an average academic achievement calculated on the basis of all end-year grades at a school report (minimum 1, maximum 5).

Autonomous evaluation of academic achievement (AAA) we measured by perceived self-evaluation of academic achievement (expressed by self-perceived quality level of knowledge and skill in whole study subjects in end of school year 2015/2016). The adolescents subjectively rated their success at school at 6-point scale: from excellent to absolutely unsatisfactory. The score for AAA ranges from minimum 1 to maximum 6. The scale was developed by the authors of research study.

Approach to learning (two main scales: deep – DA and surface – SA) we measured by The Revised Study Process Questionnaire (R-SPQ-2F [47], Slovak version [43], four subscales: deep motive (DM), deep strategy (DS), surface motive (SM) and surface strategy (SS). Each of the subscales consisted of five items. The final version of the questionnaire therefore has two main scales deep approach (DA) and surface approach (SA) with four subscales. It is rated on a 5-point Likert scale (1 = never, 2 = occasionally, 3 = sometimes, 4 = usually and 5 = always). The score for the deep approach to learning ranges from minimum 10 to maximum 50, the score for the deep motive subscale ranges from minimum 5 to maximum 25, the score for the deep strategy subscale ranges from minimum 5 to maximum 25, the score for the surface approach to learning ranges from minimum 10 to maximum 50, the score for the surface motive subscale ranges from minimum 5 to maximum 25 and the score for the surface strategy subscale ranges from minimum 5 to maximum 25. The reliability of main scales was: deep approach: Cronbach's alpha = 0.658, surface approach to learning: Cronbach's alpha = 0.683. The reliability of subscales was: deep motive: Cronbach's alpha = 0.616, deep strategy: Cronbach's alpha = 0.567, surface motive: Cronbach's alpha = 0.549 and surface strategy: Cronbach's alpha = 0.548.

For identification of significance of the relationship between research variables, we used Pearson's correlation coefficient. For identification of significant relationship between a dependent variable (HAA, AAA) and independent variables (predictors), we used linear regression analysis. The statistical significance criterion for our research study is 5% ($p \leq 0.05$). For all data analysis, we used Statistical Package for the Social Sciences (SPSS 20.0).

3. Research findings

3.1. Academic self-efficacy, approach to learning, heteronomous and autonomous evaluation of academic achievement: descriptive statistics and correlation analysis

The basic descriptive indicators of all variables considered in our study are presented in **Table 1**.

On the basis of the identified mean of the ASE, we have found out that adolescents in our study achieved a higher academic self-efficacy than the median of this variable is (also talent and effort). In the research variable deep approach to learning is the mean value below the median (also deep motive and deep strategy); for the surface approach to learning the mean value is almost equal to median (also surface motive and surface strategy). Academic achievements evaluated by teachers (HAA) and by adolescents (AAA) are better than the median for the both variables is.

From the perspective of academic self-efficacy (ASE) and its factors (talent, context and effort), we have identified significant relations between this variable and (**Table 2**):

N = 457	Min.	Max.	Mean	Std. Dev.	Med.*
Academic self-efficacy (ASE)	36	106	61.23	7.69	75
Talent (ASE-T)	15	60	29.50	5.73	37.50
Context (ASE-C)	15	36	23.99	3.29	22.50
Effort (ASE-E)	6	12	7.73	1.44	13
Deep approach to learning (DA)	10	45	27.33	5.78	30
Deep motive (DM)	5	24	14.13	3.33	15
Deep strategy (DS)	5	22	13.20	3.08	15
Surface approach to learning (SA)	13	47	30.91	5.49	30
Surface motive (SM)	5	23	15.29	3.18	15
Surface strategy (SS)	7	25	15.61	3.18	15
Heteronomous academic achievement (HAA)	1	2.75	1.57	0.43	3
Autonomous evaluation of academic achievement (AAA)	1	6	2.36	0.86	3.5

*Median as quantile value of variable in research method.

Table 1. Academic self-efficacy, approach to learning strategy, heteronomous and autonomous academic achievement: descriptive statistics.

- Deep approach to learning ($p < 0.001$), and from the perspective of individual factors combined in the deep approach to learning among adolescents (deep motive and deep strategy), both these factors significantly correlate with ASE, talent and effort. We have recorded no significant correlation with the context factor. We have identified that the higher academic self-efficacy an adolescent has, the more he or she applies the deep approach to learning.
- Heteronomous evaluation of academic achievement ($p < 0.001$), and all three factors combined in the academic self-efficacy (talent, context, effort) strongly correlate with HAA. We have observed that the higher academic self-efficacy an adolescent has, the better the results of his or her education expressed in GPA at the end of a school year are.
- Autonomous evaluation of academic achievement ($p < 0.001$), and all three factors combined in the academic self-efficacy (talent, context and effort) strongly correlate with AAA. We thus conclude that the higher the academic self-efficacy of an adolescent is, the better the subjective evaluation of achieved academic results, based on assessment of acquired information, skills and competences in individual subject, is as well (they perceive a significantly greater set of information, skills and competences in a given school year).

When it comes to mutual relations of the heteronomous evaluation of academic achievement (GPA), we have found out that it significantly correlates, in addition to academic self-efficacy (and its three factors: talent, context and effort), also with other variables (the only exception is the surface strategy subscale), while the better is the assessment of a student at the end of a school year (as expressed in GPA), the more a student prefers the deep approach to learning (including both factors: deep motive and deep strategy) and the less he or she prefers the surface approach to learning (with factors only at the level of surface motive).

N = 457		ASE	Talent	Context	Effort	DA	DM	DS	SA	SM	SS	HAA	AAA
ASE	Pearson	—											
	Sig.	—											
Talent	Pearson	0.885***	—										
	Sig.	0.000	—										
Context	Pearson	0.547***	0.131**	—									
	Sig.	0.000	0.005	—									
Effort	Pearson	0.568***	0.448***	0.110*	—								
	Sig.	0.000	0.000	0.019	—								
DA	Pearson	−0.285***	−0.263***	−0.078	−0.300***	—							
	Sig.	0.000	0.000	0.097	0.000	—							
DM	Pearson	−0.375***	−0.368***	−0.086	−0.340***	0.910***	—						
	Sig.	0.000	0.000	0.067	0.000	0.000	—						
DS	Pearson	−0.130**	−0.095*	−0.053	−0.196***	0.894***	0.629***	—					
	Sig.	0.005	0.042	0.256	0.000	0.000	0.000	—					
SA	Pearson	0.016	0.016	−0.004	0.028	−0.307***	−0.255***	−0.301***	—				
	Sig.	0.739	0.729	0.930	0.548	0.000	0.000	0.000	—				
SM	Pearson	0.042	0.024	0.012	0.104*	−0.346***	−0.277***	−0.350***	0.862***	—			
	Sig.	0.368	0.612	0.805	0.026	0.000	0.000	0.000	0.000	—			
SS	Pearson	−0.015	0.004	−0.019	−0.055	−0.184***	−0.163***	−0.170***	0.863***	0.489***	—		
	Sig.	0.746	0.928	0.691	0.238	0.000	0.000	0.000	0.000	0.000	—		
HAA	Pearson	0.406***	0.402***	0.132**	0.267***	−0.161**	−0.176***	−0.113*	0.143**	0.171***	0.076	—	
	Sig.	0.000	0.000	0.005	0.000	0.001	0.000	0.016	0.002	0.000	0.106	—	
AAA	Pearson	0.426***	0.451***	0.109*	0.230***	−0.171***	−0.201***	−0.103*	0.105*	0.097*	0.084	0.671***	—
	Sig.	0.000	0.000	0.020	0.000	0.000	0.000	0.027	0.025	0.037	0.073	0.000	—

*p < 0.05.
 **p < 0.01.
 ***p < 0.001.

Table 2. Academic self-efficacy, learning strategy and academic achievement: correlation analysis.

Within the analysis of mutual relations between heteronomous evaluation of academic achievement and autonomous evaluation of academic achievement we have identified a significant correlation ($p < 0.001$).

3.2. Academic self-efficacy and learning strategy as predictors of heteronomous academic achievement

In the first step of our research we determined participants' heteronomous evaluation of academic achievement by the academic self-efficacy (and factors of ASE), deep approach to learning (and factors of DA) and surface approach to learning (and factors of SA) as our independent variables. All independent variables are included into the presage factors in students '3P' model of teaching and learning [47]. We note that these independent variables are not all "internal" factors on the side of a student which influence learning and education process, but our intention is to identify their predictive effect to heteronomous (in second step autonomous) evaluation of academic achievement of adolescents.

Findings focused on the academic self-efficacy (ASE) and factors of ASE as predictors of heteronomous evaluation of academic achievement are shown in **Table 3**. We found out that a student's academic self-efficacy significantly predicts the heteronomous evaluation of academic achievement, variance in factors of ASE shows that only two factors: talent and effort are meaningful predictors. Academic self-efficacy explains 16.5% of the variability of heteronomous evaluation of academic achievement.

Findings related to preferred deep approach to learning (and factors of DA: deep motive and deep strategy) as a predictor of heteronomous evaluation of academic achievement are shown in **Table 4**. We note that preferred deep approach to learning significantly predicts the heteronomous evaluation of academic achievement (variance in factors of DA shows that only one factor: deep motive is a meaningful predictor). But the deep approach to learning explains only 2.6% of the variability of heteronomous evaluation of academic achievement.

According to **Table 5**, we identified that the preferred surface approach to learning significantly predicts the heteronomous evaluation of academic achievement (variance in factors of SA shows that only one factor: surface motive is a meaningful predictor). But the surface

Variable	R	R ²	F	B	Beta	t
ASE	0.406	0.165	89.770***	0.023	0.406	9.475***
ASE: Talent	0.420	0.177	32.395***	0.026	0.346	7.219***
ASE: Context				0.010	0.075	1.738
ASE: Effort				0.031	0.104	2.180*

* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.

Table 3. Academic self-efficacy (and factors of ASE) as predictor of heteronomous evaluation of academic achievement (HAA).

approach to learning explains only 2.0% of the variability of heteronomous evaluation of academic achievement.

3.3. Academic self-efficacy, learning strategy and heteronomous evaluation of academic achievement as predictors of autonomous academic achievement

In the second step of our research we determined participants' autonomous evaluation of academic achievement by the academic self-efficacy (and factors of ASE), approach to learning (deep and surface and factors of DA and SA) and heteronomous evaluation of academic achievement.

Findings related to academic self-efficacy and factors of ASE as predictors of autonomous evaluation of academic achievement are shown in **Table 6**. We found out that a student's academic self-efficacy significantly predicts the autonomous evaluation of academic achievement. Academic self-efficacy explains 18.2% of the variability of autonomous evaluation of academic achievement. Variance in factors of ASE shows that only one factor: talent is a meaningful predictor.

On the base of findings represented in **Table 7**, we note that preferred deep approach to learning significantly predicts the autonomous evaluation of academic achievement (variance in factors of DA shows that only one factor: deep motive is a meaningful predictor). The deep approach to learning explains only 2.9% of the variability of autonomous evaluation of academic achievement.

Variable	R	R ²	F	B	Beta	t
DA	0.161	0.026	12.139***	−0.012	0.003	−3.484***
DM	0.176	0.031	7.256***	−0.022	−0.174	−2.928**
DS				0.000	−0.003	−0.052

* p < 0.05.
 ** p < 0.01.
 *** p < 0.001.

Table 4. Deep approach to learning (and factors of DA) as predictor of heteronomous evaluation of academic achievement (HAA).

Variable	R	R ²	F	B	Beta	t
SA	0.143	0.020	9.511**	0.011	0.143	3.084**
SM	0.172	0.029	6.892***	0.024	0.177	3.333***
SS				−0.001	−0.011	−0.202

* p < 0.05.
 ** p < 0.01.
 *** p < 0.001.

Table 5. Surface approach to learning (and factors of SA) as predictor of heteronomous evaluation of academic achievement (HAA) regression analysis.

According to research findings in **Table 8**, we identified that preferred surface approach to learning significantly predicts the heteronomous evaluation of academic achievement, but the surface approach to learning explains only 1.1% of the variability of autonomous evaluation of academic achievement.

Findings related to heteronomous evaluation of academic achievement as a predictor of autonomous evaluation of academic achievement are shown in **Table 9**. The heteronomous evaluation of academic achievement (the average of the marks, rating by teachers, in all subjects in the end-year report: as GPA) is a strong predictor of the autonomous evaluation of academic achievement. The heteronomous evaluation of academic achievement explains 45.00% of the variability of autonomous evaluation of academic achievement. The final model tested through individual steps of impact of independent variables of our research on the autonomous evaluation

Variable	R	R ²	F	B	Beta	t
ASE	0.426	0.182	100.919***	.048	0.426	10.046***
ASE: Talent	0.455	0.207	39.437***	0.065	0.431	9.165***
ASE: Context				0.013	0.049	1.162
ASE: Effort				0.019	0.032	0.681

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 6. Academic self-efficacy (and factors of ASE) as predictor of autonomous academic achievement (AAA).

Variable	R	R ²	F	B	Beta	t
DA	0.171	0.029	13.688***	−0.026	−0.171	−3.700***
DM	0.203	0.041	9.793***	−0.059	−0.225	−3.810***
DS				0.011	0.038	0.646

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 7. Deep approach to learning (and factors of DA) as predictor of autonomous academic achievement (AAA).

Variable	R	R ²	F	B	Beta	t
SA	0.105	0.011	5.082*	0.017	0.105	2.254*
SM	0.106	0.011	2.577	0.020	0.074	1.384
SS				0.013	0.048	0.893

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 8. Surface approach to learning (and factors of SA) as predictor of autonomous academic achievement (AAA).

of academic achievement is presented in **Table 10**. The academic self-efficacy of adolescents and the heteronomous evaluation of academic achievement by teachers were shown as best/strongest predictors of autonomous evaluation of academic achievement.

In the last step of our research, we determined participants' academic self-efficacy (and factors of ASE) by autonomous academic achievement of the academic as our independent variable.

The autonomous evaluation of academic achievement is a strong predictor of the academic self-efficacy of students in adolescence (and all factors of ASE, too, **Table 11**). The autonomous

Variable	R	R ²	F	B	Beta	t
AAA	0.671	0.450	371.694***	1.352	0.671	19.279***

* p < 0.05.
 ** p < 0.01.
 *** p < 0.001.

Table 9. Heteronomous evaluation of academic achievement (HAA) as predictor of autonomous academic achievement (AAA).

	Variable	R	R ²	F	B	Beta	t
Step 1	ASE	0.426	0.182	100.919***	0.048	0.426	10.046***
Step 2	ASE	0.438	0.192	35.812***	0.047	0.418	9.453***
	DA				−0.004	−0.024	−0.512
	SA				0.014	0.091	2.050*
Step 3	ASE	0.692	.479	103.732***	0.020	0.179	4.642***
	DA				−0.003	−0.021	−0.558
	SA				0.002	0.011	0.307
	HAA				1.196	0.593	15.771***

* p < 0.05.
 ** p < 0.01.
 *** p < 0.001.

Table 10. Autonomous academic achievement (dependent variable): final model.

Variable	R	R ²	F	B	Beta	t
ASE	0.426	0.182	100.919***	3.782	0.426	10.046***
ASE: talent	0.451	0.204	116.423***	2.985	0.451	10.790***
ASE: context	0.109	0.012	5.486*	0.416	0.109	2.342*
ASE: effort	0.230	0.053	25.427***	0.382	0.230	5.042***

* p < 0.05.
 ** p < 0.01.
 *** p < 0.001.

Table 11. Autonomous academic achievement (AAA) as predictor of academic self-efficacy (ASE, factors of ASE).

evaluation of academic achievement explains 18.2% of the variability of academic self-efficacy of adolescents.

4. Discussion and conclusion

Figure 1 presents a model of impact of academic self-efficacy and approach to learning on heteronomous or autonomous assessment of academic achievement we have developed based on results of our research. In this study, we have identified mutual relations between variables (relying on the model by Biggs et al. [47]) and impacts of selected educational factors depending on a student (namely an academic self-efficacy of a student and an approach to learning he or she prefers) on the academic achievement which, in our opinion, should be perceived from two perspectives: heteronomous evaluation of academic achievement and autonomous evaluation of academic achievement. We assumed that heteronomous evaluation expressed in grades given by a teacher/teachers as a consequence of achieved learning results significantly affects the autonomous evaluation of academic achievement (expressed in a student’s own beliefs about knowledge, skills or competences acquired during the school year taking into account own assessment, priorities and objectives associated with learning and education).

Our assumption about the correlation between all examined variables was confirmed in accordance with the model by Biggs et al. [47], and our findings also confirm conclusions of studies performed by Floyd et al. [45]. The only exception was a characterological variable of “presage students factors”: surface approach to learning, where we observed no significant correlation with the academic self-efficacy. Looking for mutual relations of the academic self-efficacy (and its subscales) and preferred approach to learning (deep and surface and their respective

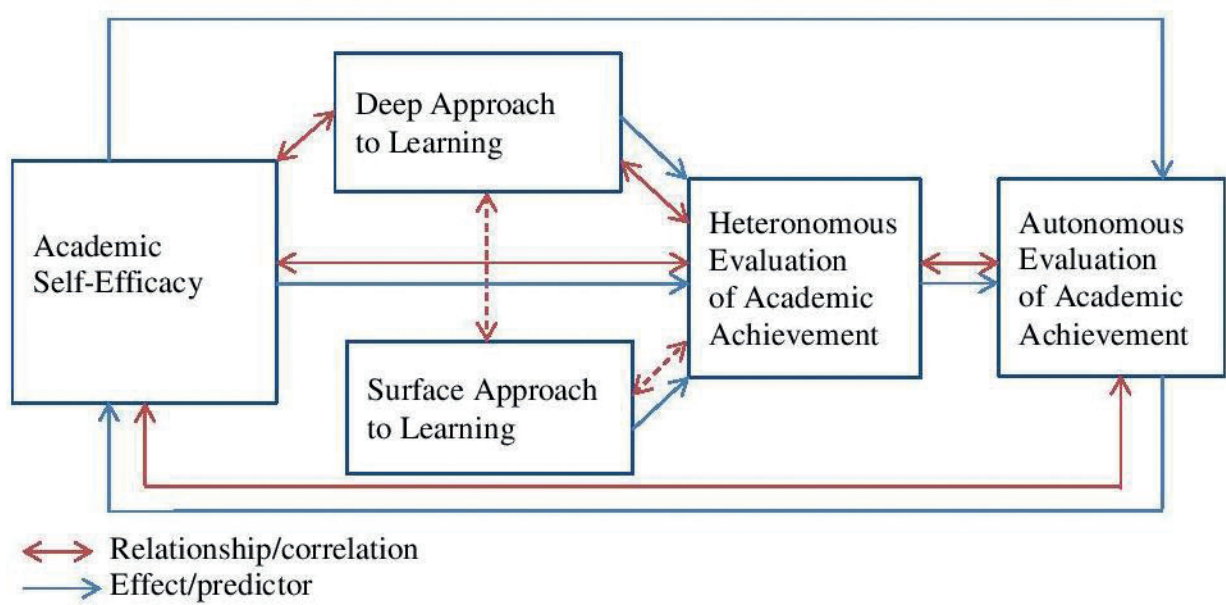


Figure 1. Model of impact of academic self-efficacy, approach to learning on heteronomous and autonomous evaluation of academic achievement of adolescents.

subscales related to motivation and strategy: except for the surface strategy subscale) with academic achievement (heteronomous and autonomous) we have reported significant correlations. We are convinced that verified relations between academic self-efficacy, approach to learning and academic achievement are important for health cognitive functions of adolescents and promote health behaviour (similarly [2, 16, 19, 29]).

In relation to the variables that constitute a group of the so-called presage students factors we have identified that both academic self-efficacy and preferred approach to learning (deep or surface) are significant predictors of heteronomous evaluation of academic achievement, as evaluated from the outside: that is the output evaluation of academic achievements in learning subjects with a grade provided by teachers on a school certificate at the end of each school year. The conclusion that academic self-efficacy influences academic achievement was confirmed also by numerous other researchers [16, 20, 21].

We have recorded a significant predicative correlation of heteronomous evaluation of academic achievement (measured by GPA) on autonomous evaluation of academic achievement that serves as an expression of students' perception of acquired knowledge, skills and competences within school subjects (their educational progress). Furthermore, we have found out that autonomous evaluation of academic achievement is a significant predictor of academic self-efficacy: and the more positively students evaluate the level of acquired knowledge, skills and competences, the higher their academic self-efficacy is. Similarly, Stankov [54] also concludes that there is a real difference between our actual ability to solve problems in a study (study subjects) and what we think our ability level in a particular domain is. People also think that they are good (self-concept) in some study subject (e.g., in English) and they are bad in other (e.g., in mathematics) and may be afraid (anxious) when solving problems in the study subject in which are bad. When shown bad study subject problems our self-efficacy is also affected to some extent by what we believe our strengths and weaknesses are and by our previous experiences with similar problems. Obviously, what we believe about ourselves does matter when we are engaged in academic pursuits and it may play an important role in, for example, the selection of the academic discipline for study and in career choice. Self-confidence is related to our self-beliefs and it is also related to cognitive performance.

The implication is that researchers and teachers should be looking for students beliefs about their educational capabilities, because they are important components of motivation and of academic achievement. Based on our research findings as well as on a previously published study [10], we conclude that when students believe in their success in a given school subject (e.g., Slovak language, English language, Mathematics or any other subject) or generally believe in their good academic achievements, they demonstrate high levels of academic self-efficacy. The self-efficacy beliefs are important as through them the learning processes, motivations, passion and selectiveness regulates the individual's use in different areas [55]. An important factor, however, in this process is the heteronomous evaluation by a teacher that affects autonomous evaluation of academic achievement on a student's side as a part of his or her metacognition process.

A teacher plays an important role in providing opportunities for students to be successful. Our study implies that the impact of educational factors depending on a student, particularly the

factor of academic self-efficacy of a student and the selection of preferred approach to learning combined with heteronomous and autonomous evaluation contributes to the general school success. Each teacher who provides a student with heteronomous evaluation should take into account that this evaluation significantly affects both student's autonomous evaluation and his or her self-efficacy. Therefore, a teacher should not focus on failures of a student or areas, where a student does not excel and should not stress them in his or her evaluation. Such assessment decreases self-evaluation related to academic achievement, leads to lower self-efficacy perceived by a student and thus creates a kind of vicious circle. A teacher providing heteronomous evaluation should concentrate primarily on a student's strengths, stimulate his or her development and highlight individual and personal potential of a student followed by positive feedback, evaluation and praise. As a consequence a teacher should act with a view to increase a student's self-efficacy and work on enhancing his or her self-confidence. A positive evaluation by a teacher stimulates also better autonomous evaluation of a student's own achievements, which, in turn, positively influences high academic self-efficacy. Furthermore, the high academic self-efficacy results in preferences for deep approach to learning. Through this mechanism a student is more successful in school. This is, therefore, a single dynamic complex of impacts of factors that result in school success of adolescents. We believe that a positive gradation of this dynamic complex that constitutes a part of the general school success of adolescents is a foundation of a student's deep faith in his or her own strengths. This, in turn, significantly affects student's further professional orientation and predetermines his or her future choices.

5. Limitations

We realise that the limit for full generalisation of research findings is that the research sample was not a random sample. The participation of the students in adolescent age in the research was voluntary. On the other side we administrated research methods in 18 high schools in all regions of Slovakia and only 3 addressed students did not participate in the research. The limit for the in-depth analysis of descriptive indicators of our research is that research methods are used experimentally in Slovakia and there are no relevant norms for the Slovak population of adolescents. On the other hand we find out good reliability of used research methods.

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