APPROACHES TO LEARNING IN A HIGH-SCHOOL SETTING: FACTOR STRUCTURE AND INFLUENCE OF INDEPENDENT VARIABLES

Desislava Plamenova Petrova

Department of Social, Work, Clinical and Educational Psychology,
Sofia University "St. Kliment Ohridski", 15 Tsar Osvoboditel Blvd., Sofia 1504, Bulgaria

Abstract

The aim of this paper is to present the results of a psychological study of students` approaches to learning in Bulgarian high-school setting. A total of 335 secondary students (157 males, 166 females), aged 14 – 18 years, were administered the Revised Approaches to Studying Inventory (Duff 1997), adapted for Bulgarian conditions by Y. Yankulova (Yankulova 2014). Factor analysis identified three factors explaining 41.4% of the total variance (KMO = .830, Bartlett's Test p = .000 < .05). At the first factor, deep approach, differences were found according to gender (t(323) = -2.965, p = .003 < .05), academic performance (F(302) = 6.285, p = .000 < .05), and extracurricular non-sporting activities (t(286) = -3.222, p = .001< .05). At the second factor, surface approach, differences were established in terms of gender (t(323) = -5.192, p = .000 < 0.05) and school grade (F(335) = 2.856, p = .037 < .05). And at the third factor, strategic approach, differences were observed according to gender (t(323) = -2.887, p = .004 < .05), school grade (F(335) = 3.286, p = .021 < .05), academic performance (F(302) = 10.838, p = .000 < .05), and extracurricular non-sporting activities (t(286) = -1.895, p = .059 > .05). The analysis and the conclusions derived from it can serve as a basis for further psychological research in the field, as well as for enhancing the quality of learning in secondary education.

Keywords: *approaches to learning, approaches to studying, adolescents, secondary education, high-school setting, factor structure, individual differences, independent variables*

1. INTRODUCTION

The last few decades have witnessed rapid and unpredictable scientific, socio-cultural and economic changes, often referred to as a transition from industrial to information society. This transition has had significant impact both at the individual and collective level. Individuals are now forced to continuously take part in a dynamic process of learning. As a result of this, there is a growing interest in re-evaluating and revising the leading educational priorities and policies so that youth can be effectively prepared for their transition to adulthood. In the light of all these events, a further exploration of what determines the quality of students' learning products seems most timely.

Previous studies have shown that quality of learning is affected by various cognitive-personality factors including the way humans approach learning [1] [2] [3]. The concept of approaches to learning (or approaches to studying) originated from phenomenographic research and refers to how students typically learn in terms of a combination between type of learning strategy and motivational orientation [4] [5]. Throughout this paper we use the terms 'approaches to learning' and 'approaches to studying' interchangeably.

The main distinction is considered to be between deep and surface approaches, as well as one other approach [6], usually referred to as strategic [7] or achieving [8]. Students with deep approach to learning find intrinsic enjoyment in learning and invest effort into examining the logic of arguments, understanding key concepts and relating them to previous knowledge and everyday experience. On the other hand, the surface approach is associated with investing minimum effort in order to deal with compulsory demands. This often includes focusing on rote memorization of details without integration or reflectiveness about strategies and purpose. As far as the strategic (achieving) approach is concerned, it refers to the striving for excellent learning outcomes through effective resource management and work organization [9] [10] [11].

There is an overall consensus that the deep approach appears to be the most preferable way to learn. However, findings [12] imply that the exclusive use of this approach might cause students to lose motivation to graduate. In this regard, it seems important to also help students cultivate skills associated with the strategic (achieving) approach [13].

Although student approaches to learning have been a popular research area in educational psychology, there is still a need for further investigation of the phenomenon in different cultures and contexts. Y. Yankulova is a pioneer in thoroughly exploring the characteristics of approaches to learning in Bulgarian academic setting [14]. However, no one to the best of our knowledge has studied Bulgarian secondary students' approaches to learning.

This paper reports on a psychological study which examines students' approaches to learning in a Bulgarian high-school setting. The study had two specific objectives or research questions: (1) to test the Bulgarian version of the Revised Approaches to Study Inventory - RASI [15] on a sample of secondary students and to establish the peculiarities in the factor structure; (2) to test if students' approaches to learning are significantly affected by independent variables such as gender, age, school grade, type of school, academic performance and extracurricular activities.

2. METHOD

2.1. Participants

The sample consisted of 335 adolescents (157 males and 166 females) from three public high schools with a different profile, situated in Sofia, Bulgaria. Students' ages ranged from 14 to 18 years with a mean of 16.11 years (SD = 1.07). The distribution by grade was as follows: 30.7% of the sample was in grade 9, 24.6% in grade 10, 34.8% in grade 11 and 9.9% in grade 12. There were no participants identified by their teachers as having special needs. Pupils who had completed fewer than 75% of the items on the RASI were classified as incomplete and their data were omitted from the subsequent analysis (N = 7).

2.2. Measure

Approaches to learning were appraised through the Revised Approaches to Studying Inventory – RASI [16] comprising 30 brief statements responded to on a 5-point scale, ranging from 1 (completely disagree) to 5 (completely agree). An example item is: "I organise my study time carefully to make the best use of it". The instrument was translated into Bulgarian and adapted for Bulgarian conditions by Y. Yankulova [17] using a sample of 663 university students. For the purposes of the present study few items in the Bulgarian version were only slightly modified to fit the high school context (i.e. replacing "lectures/courses" with "classes").

2.3. Procedure and statistical analysis

The aims and rationale of the study were explained to the headmasters in each school during a personal meeting or with the support of the school psychologists. Informed consent was obtained from parents/carers when necessary. The study itself was conducted in November 2018 as part of a regular school class (40-45 min). After a brief group explanation on confidentiality, the purpose of the activities, as well as the answer format, students were required to fill out an anonymous paper-based self-report questionnaire including the research instrument described below and sociodemographic questions. All the data was then transferred to and analysed with the computer program SPSS-19.

3. RESULTS

3.1. Internal reliability and factor structure of the RASI

The reliability of RASI was estimated using Cronbach's alpha and a good internal consistency of the 30-item scale on the total sample (N = 335) was found **(α = .771**). The respondent data's sufficiency for factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy.

In the present study the KMO coefficient for the sample was above the 0.6 threshold suggested by Tabachnik and Fidell [18] and Bartlett's Test of Sphericity was significant **(KMO = .830, χ^2 (335) = 2356.7, p = .000 < .05)**. In addition, review of the diagonals on the anti-image correlations revealed that the lowest Measure of Sampling Adequacy (MSA) for individual variables equaled **.590 > .5**, so no items were removed prior to analysis.

Exploratory factor analysis (EFA) was carried out in order to allow related variables to cluster and create factors [19]. The Principle Component Analysis (PCA) revealed a potential eight-factor model with all factors having eigenvalues above 1 (Kaiser's K1 criterion) [20] and cumulatively explaining 62.1% of the total variance. Scree plot test [21] and Parallel Analysis (PA) [22] conducted using the syntax available from O'Connor's website [23] were used to confirm the factor retention.

The visual inspection of the Scree plot involves identifying the cutoff for the numbers of factors to extract. Despite the simplicity and visual nature of the scree plot method, some researchers [24] believe that choosing a cutoff can be subjective when there are gradual or multiple changes in slope. Therefore it is recommended to combine Cattel's test with PA. This analysis is also based on the scree test, yet at the same time it allows to minimize overidentification of factors due to sampling error. PA's procedure includes a comparison between two correlation matrices: 1) a correlation matrix with eigenvalues from real data; 2) a computed correlation matrix with randomly generated eigenvalues based on the sample size of the actual data and number of variables. Factors from the actual data are retained as long as they are above the 95th percentile line generated by the random data matrices [25].

In the present study there was a dramatic change in slope of the screeplot at the third factor. Similarly, PA results indicated that the fourth factor is just at the threshold of the 95th percentile and thus does not bear further investigation (Figure 1).

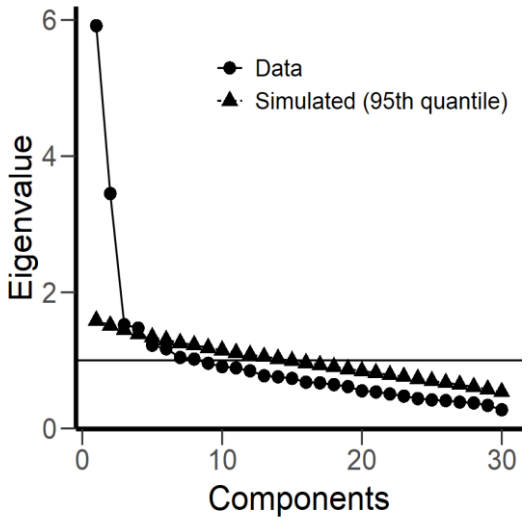

Fig. 1. Scree Plot and Parallel Analysis eigenvalues for RASI factors
Note: RASI = Revised Approaches to Studying Inventory.

Using orthogonal rotation did not result in achieving simple structure, therefore the three factors were rotated via oblique rotation - the Promax algorithm with Kaiser Normalization (k = 4). Oblique rotation methods allow factors to be correlated and are considered to be warranted if there are factor correlations above .32 [26]. In this sample the factor correlation matrix revealed that the correlation between factor 1 and factor 3 equaled .495 > .32 so there was at least 10% overlap in variance between factors.

The factor pattern matrix is presented in Table 1. The examination of the item loadings between factors showed that there were a few items that had lower loadings on their respective factor. However, these were not viewed as problematic as they were not clustered on a single factor. In addition, it was found that three items loaded on more than one factor. Item 5 ('I often have trouble making sense of the things I have to remember') loaded on factors 2 and factor 3, while Item 20 ('When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.') and Item 25 ('When I'm reading, I examine the details carefully to see how they fit in with what's being said.') loaded on both factor 1 and factor 3. In spite of these cross-loadings, as well as two items (item 13 and item 22) being allocated to a different factor than the one we would expect based on the theoretical model, the three factors were substantively identical to the original structure [27] and were thus labeled accordingly: deep approach, surface approach, strategic approach.

Table 1. Factor pattern matrix for the RASI (N = 335)

Item	**Factor 1.** Deep Approach	**Factor 2.** Surface Approach	**Factor 3.** Strategic Approach
9.	**.708**		
28.	**.691**		
17.	**.524**		
30.	**.499**		
20.	**.430**		.375
1.	**.409**		
4.	**.353**		
25.	**.351**		.379
22.	**.326**		
23.	**.324**		
11.		**.703**	
26.		**.639**	
6.		**.595**	
3.		**.594**	
5.		**.532**	-.384
7.		**.523**	
18.		**.511**	
14.		**.465**	
16.		**.456**	
21.		**.436**	
12.			**.872**
29.			**.803**
24.			**.803**
19.			**.718**
27.			**.455**
8.			**.408**
10.			**.384**
13.			**.359**
15.			**.348**
2.			**.339**

Note: RASI = Revised Approaches to Studying Inventory. Coefficients that define each factor are displayed in bold. Item 25 was allocated to factor 1 in accordance with the original structure. Extraction method: Principal Component Analysis. Rotation method: Promax with Kaizer Normalization

The final test of the applicability of a three-factor solution came through an analysis of the reliability coefficients of the proposed subscales. Results indicated that all the factors had solid internal reliabilities: 1) deep approach (items 1, 4, 9, 17, 2. 22, 23, 25, 28 and 30): **α = .732**; 2) surface approach (items 3, 5, 6, 7, 11, 14, 16, 18 and 26): **α = .756**; 3) strategic approach (items 2, 8, 10, 12, 13, 15, 19, 24, 27 and 29): **α = .800**. Therefore it could be concluded that a three-factor solution accounting for 41.4% of the total variance would be appropriate.

3.2. Descriptive statistics

Table 2 shows descriptive statistics for the RASI total scale and subscales. The Skewness and Kurtosis coefficients are within the acceptable range for normal distribution of data (-1,+1), indicating that both the subscales and the global score appear to be normally distributed. The examination of the mean scores of the three subscales indicated that the most preferred approach was strategic approach (M = 37.55, SD = 8.046), followed by deep approach (M = 34.62, SD = 6.084). The least preferred approach by participants turned out to be surface approach (M = 31.72, SD = 7.458). The findings are indicative of secondary students' desire to actively and deeply participate in the learning process, as well as to effectively plan and organize their time and resources so that they can achieve maximum results.

Table 2. Descriptives for the RASI factors and global score (N = 335)

Factors (items)	M	SD	Min	Max	Median	Mode	Skewness	Kurtoses
Deep approach (10)	34.62	6.084	17	50	35.00	36	-.174	-.003
Surface approach (10)	31.72	7.458	10	48	32.00	31	-.192	-.297
Strategic approach (10)	37.55	8.046	15	55	37.00	37	-.152	-.109
Approaches to studying (30)	100.45	13.454	49	139	100.00	101	-.211	.766

Note: RASI = Revised Approaches to Studying Inventory.

3.3. Independent variables

In order to answer the second research question, we examined the influence of demographic variables and education-related factors on the approaches to studying. Results showed that ***gender*** significantly impacts all the RASI dimensions accounting for 2.6% of the variance in deep approach, 7.6% of the variance in surface approach and 2.6% of the variance in strategic approach. Independent Samples t-test indicated that female participants reported higher scores on all the subscales than did male participants (Table 3). Overall results are congruent with previous research in Bulgarian higher education setting [28] which revealed that female university students appear to feel more anxious about learning (surface approach), and yet at the same time, they are more skilled in self-reflection, strategic planning and self-regulation than men (strategic approach). On the other hand, significant differences in deep approach can be explained with the fact that adolescent girls are found to be more focused on learning and to value school work more than boys [29].

Table 3. Independent Samples T-test results for the mean scores obtained from the RASI general scale and subscales based on gender

Gender	N	M	SD	df	t	p
Deep approach				323	-2.965	.003
Male	157	**33.58**	5.738			
Female	166	**35.56**	6.238			
Surface approach				323	-5.192	.000
Male	157	**29.59**	6.938			
Female	166	**33.77**	7.494			
Strategic approach				323	-2.887	.004
Male	157	**36.18**	7.341			
Female	166	**38.77**	8.698			

Note: RASI = Revised Approaches to Studying Inventory.
Mean scores that are significantly different from one another are displayed in bold.

An analysis of variance showed that the effect of ***age*** on any of the RASI dimensions was not significant: deep approach (F (335) = 1.000, p = .408 > .05), surface approach (F (335) = 1.923, p = 1.106 > .05), strategic approach (F (335) = 1.739, p = 1.141 > .05). However, the One-way ANOVA-test results indicated that ***school grade*** explained 2.5% of the differences in the preferences for surface approach and 2.9% of the varience in strategic approach (Table 4).

Table 4. One-way ANOVA-test results for the mean scores obtained from the RASI general scale and subscales based on grade.

Grade	N	M	SD	df	F	p
Deep approach				335	1.191	.313
9th	105	34.60	6.176			
10th	81	33.63	6.268			
11th	116	35.28	5.545			
12th	33	34.82	7.042			
Surface approach				335	2.856	.037
9th	105	**32.83**	6.213			
10th	81	31.62	7.534			
11th	116	31.71	7.997			
12th	33	**28.52**	8.292			
Strategic approach				335	3.286	.021
9th	105	36.57	8.030			
10th	81	**36.05**	7.837			
11th	116	**39.16**	7.529			
12th	33	38.70	9.449			

Note: RASI = Revised Approaches to Studying Inventory. Mean scores that are significantly different from one another, as indicated by the Post Hoc Test (Dunnett T3 or Tukey HSD), are displayed in bold.

Post hoc analyses using the Tukey HSD post hoc criterion for significance showed that the surface approach mean score of 9-th grade students was significantly higher (M = 32.83, SD = 6.213) than the one of 12th grade students (M = 28.52, SD = 8.292) (p = .05). And in regards to differences in strategic approach, Post hoc analyses using the Dunett T3 post hoc criterion for significance found evidence for significant changes happening in the period 10th grade (M = 36.05, SD = 7.837) – 11th grade (M= 39.16, SD = 7.529) (p = .045). Together the present results confirm that throughout the course of secondary education students acquire relevant self-regulated learning skills that allow them to approach studying strategically rather than superficially.

Contrary to the findings of Y. Yankulova [30] we did not find any significant variance based on the ***educational institution*** participants study at: deep approach (F (335) = 2.410, p = .091 > .05), surface approach (F (335) = 2.567, p = .078 > .05), strategic approach (F (335) = .574, p = .564 > .05). On the one hand, these contradictions may be caused by limitations of the present study, as well as specific differences between the secondary and higher education systems in Bulgaria. On the other hand, previous research [31] suggests that students' approaches to studying are more directly affected by their perceptions of contextual factors rather than the context itself.

Another promising finding was that 5.4% of the variance for deep approach (F (302) = 6.285, p = .000 < .05) and 8.9% of the variance for strategic approach (F (302) = 10.838, p = .000 < .05) could be explained by ***academic performance*** (measured by self-reported Grade Point Average (GPA) from the previous school year) (Table 5). Post hoc analyses using the Tukey HSD post hoc criterion for significance indicated that students with a GPA bellow 4.5 reported a significantly lower average score on deep approach (M = 31.46, SD = 6.450) than did students with a GPA between 4.5 and 5.5 (M = 34.54, SD = 5.568) (p = .015 < .05) or students with a GPA above 5.5 (M = 36.10, SD = 6.349) (p = .000 < .05). Similarly, it was found that students with higher GPA scores approached studying more strategically than did students with lower GPA scores. Significant differences were identified between the mean scores of all the three groups: GPA bellow 4.5. (M = 33.00, SD = 6.725), GPA between 4.5 and 5.5 (M = 36.67, SD = 8.001) and GPA above 5.5 (M = 40.33; SD = 7.792) (p = .000 or p = .018 < 0.05). These findings were in line with previous research in Bulgarian academic setting [32] [33].

Table 5. One-way ANOVA-test results for the mean scores obtained from the RASI general scale and subscales based on Grade Point Average (GPA) from the previous school year

GPA from previous school year	N	M	SD	df	F	p
Deep approach				302	6.285	.000
Bellow 4.5	45	**31.64**	6.450			
Between 4.5 and 5.5	142	**34.54**	5.568			
Above 5.5	115	**36.10**	6.349			
Surface approach				302	.452	.716
Bellow 4.5	45	30.64	8.389			
Between 4.5 and 5.5	142	31.92	7.292			
Above 5.5	115	31.69	7.627			
Strategic approach				302	10.838	.000
Bellow 4.5	45	**33.00**	6.725			
Between 4.5 and 5.5	142	**36.67**	8.001			
Above 5.5	115	**40.33**	7.792			

Note: RASI = Revised Approaches to Studying Inventory. Mean scores that are significantly different from one another are displayed in bold. Grading Scale in Bulgaria is based on grades of 5 numbers ranging from 2 to 6: 2.00-2.99 – failed, 3.00- 3.50 – satisfactory, 3.50-4.50 – good, 4.50-5.50 – very good, 5.50-5.50 – excellent.

Independent samples T-tests were used in order to investigate whether ***extracurricular activities*** significantly affect the approaches to studying preferences. The analysis did not identify any significant differences based on the participation in *extracurricular SPORTING activities*: deep approach (t (286) = .518, p = .605 > .05), surface approach (t (286) = .989, p = .323 > .05), strategic approach (286) = -.136, p = .892 > .05). However, *extracurricular NON-SPORTING activities* were found to significantly affect student's preferences for deep approach (t (286) = -3.222, p = 0.001< 0.05) and strategic approach (t (286) = -1.895; p = 0.059 > 0.05), explaining 3.5% and 1.3% of the variance in the respective factors (Table 6). Results revealed that students participating in school clubs, vocational activities, volunteering, student council and different types of courses scored higher scores than did those only taking part in curricular activities. Overall the present study provides additional support for the role of extracurricular activities on learning. On the one hand, sports participation was found to have both positive and negative effect on academic outcomes [34]. On the other hand, earlier research [35] indicated that constructive non-academic activities at school or in the community can act as a facilitator of positive adolescent development in terms of academic performance, school engagement etc.

Table 6. T-test results for the mean scores obtained from the RASI general scale and subscales based on extracurricular NON-SPORT activities.

Extracurricular NON-SPORT activities	N	M	SD	df	T	p
Deep approach				286	-3.222	.001
No	151	**33.73**	5.495			
Yes	135	**36.01**	6.501			
Surface approach				286	.200	.841
No	151	31.53	6.861			
Yes	135	31.35	8.308			
Strategic approach				286	-1.895	.059
No	151	36.89	7.402			
Yes	135	38.72	8.723			

Note: RASI = Revised Approaches to Studying Inventory. Mean scores that are significantly different from one another are displayed in bold.

4. DISCUSSION

To sum up, this work has been a preliminary attempt to investigate the factor structure and differential features of approaches to learning in Bulgarian high-school setting. Although previous research [36] [37] identified four factors in the factor structure of the Revised Approaches to Study Inventory in Bulgarian academic environment, the original three-factor embodiment (deep, surface and strategic approaches) [38] was replicated in the studied context.

Regarding the differential features not all expected theoretical conceptions were detected. No significant differences were revealed between students based on school, age and extracurricular sporting activities. On the other hand, student's approaches to learning were found to be affected by *gender* (all approaches), *school grade* (surface and strategic approaches), *academic record* (deep and strategic approaches), as well as *extracurricular non-sporting activities* (deep and strategic approaches).

Based on these observations it is possible to conclude that considerable insight has been gained with regard to the influence of independent variables (gender, school grade, academic performance and extracurricular non-sporting activities). However, the current study clearly has some limitations. For instance, it was conducted on a sample of 335 Bulgarian secondary students studying at three high

schools in Sofia, so findings might not necessarily be generalized to the larger population. Despite this the author believes that the provided evidence has important implications for further research in the field of educational psychology and could support policy makers and education practitioners in the process of developing effective learning programs, as well as improving the quality of secondary school education in Bulgaria.

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