

LATENT STRUCTURE OF LEARNING GOALS AND STRATEGIES¹

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Abstract. A review of the relevant literature demonstrates disagreement regarding the number and nature of factors that affect learning goals and strategies, as well as whether the goals and strategies may be treated as separate groups of phenomena. In order to clarify this controversy, a sample of 364 Belgrade University students was given an instrument consisting of 94 indicators taken from a larger number of available instruments that measure approaches to learning, goal orientations and learning strategies. Factor analysis, applied on the obtained data, showed that six first-order factors related to learning goals and seven first-order factors related to learning strategies explain the latent structure of the phenomenon. Then, second-order factor analysis was applied on the pool of obtained factor scores. The assumption that learning goals and strategies share a similar latent structure was confirmed. The results show that a large number of these factors can be predominantly reduced to three latent dimensions: deep approach, surface approach, and achievement approach. The paper suggests that precise operationalisation of the achievement approach is required in the future research.

Key words: learning goals, learning strategies, structure, factor analysis, approaches to learning.

Learning goals and strategies are a topic of interest of a large number of studies that use a multitude of different instruments. Mirkov (2008a) cites 13 instruments with nearly 120 factors pretending to measure these phenomena. Although it is obvious that based on the operationalisation itself we are dealing with the same or very similar indicators, factors are named differently, which indicates a conceptual and methodological disorder. If the complete structure of conative (personality) functioning can be reduced to 1 to 7 factors (Eysenck, 1992; Costa & McCrae, 1992; Cloninger & Svrakic,

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1994; Benet & Waller, 1995; Zuckerman *et al.*, 1988; Ashton *et al.*, 2004; Musek, 2007), then it is unrealistic to assume that so many factors are required for explaining motivation and approaches to learning. Using the paradigm used in personality psychology and psychology of intelligence, we can assume that the number of “different” factors can be reduced to a reasonable amount.

The largest number of instruments is based on and developed within SAL (*Students' Approaches to Learning*) – a perspective of approaches to learning in which learning motives and strategies are treated as the components of approaches to learning. As early as in the 1980s, there appeared a learning model in which personality factors and situation factors were linked in such a way as to yield three approaches to learning: deep approach, surface approach, and achievement approach (Biggs, 1984; 1985). This model was based on empirical findings, tested and confirmed by a large number of researchers on different samples throughout the world (Mirkov, 2009). However, different and often contradictory results were obtained in the studies, which was attributed to different causes, such as: metric characteristics of instruments, applied procedures in data analysis and/or peculiarities of the comprised samples.

The majority of instruments measuring approaches to learning are multidimensional: SPQ (*Study Process Questionnaire*), i.e. LPQ (*Learning Process Questionnaire*), contains six scales of motive and strategy components, referring to three approaches (Fox *et al.*, 2001). *Approaches to Study Inventory* – ASI in different versions most frequently contains four or five scales with a different number of subscales (Richardson, 1994a; 1994b; Kember & Leung, 1998; Sadler-Smith & Tsang, 1998; Waugh & Addison, 1998; Waugh, 2002b).

Analyses indicate that the results obtained on the SPQ are congruent with the findings obtained on the ASI (Wilson *et al.*, 1996; Sadler-Smith & Tsang, 1998; Fox *et al.*, 2001). Still, there is some ambiguity related to the achievement approach (Kember & Leung, 1998). Kember *et al.* conclude that the two-factor version is the most economic one, since the function of scales measuring the third approach is not that clear as the role of scales measuring the deep and surface approaches to learning (Kember *et al.*, 2004).

The authors traditionally point out that learning is guided by several mutually exclusive goals. A large number of studies identified achievement orientation or ego-orientation and learning orientation or task-orientation (Seegers *et al.*, 2002). These orientations are linked with achievement, application of learning strategies, the way of perceiving success and failure, as

well as the sense of efficacy (Seifert, 1995). A large number of studies focus on re-examining the traditionally set dichotomy learning – achievement, i.e. task - ego (Suarez Riveiro *et al.*, 2001; Valle *et al.*, 2003). In addition to this, it is pointed out to the possibility of existence of different tendencies within these two extensive orientations (Mirkov, 2008b).

Goal orientations are included in research of learning styles. Using factor analysis on the instrument *Inventory of Learning Styles* – ILS (Vermunt, 1998), four learning styles were obtained, which was confirmed in later research (Busato *et al.*, 1998; Boyle *et al.*, 2003). Vermunt points out to similarities of certain styles with approaches to learning. Meaning-oriented style and reproduction-oriented style cover deep and surface approaches. The consistency of findings indicating that learning styles not oriented and oriented towards application should be separated from meaning-oriented and reproduction-oriented styles, points out to the conclusion that student behaviour in learning encompasses more than what is covered by deep and surface approaches.

A large number of different factors appear in literature, although it is obvious that different names are given to the factors measured by the same or very similar indicators, while the factors that are named the same are measured by different indicators. Besides, it is very difficult to separate goals and strategies. Strategy is defined with respect to the set goal. Even in research of approaches to learning, in which strategies are studied with respect to motives, the congruence between the two is confirmed. Bearing in mind the lack of domestic empirical studies about learning goals and strategies, this paper will study the relations between these two phenomena.

The goal of this paper is to analyse the latent structure and relations of learning goals and strategies on a comprehensive sample of indicators taken over from available international instruments. The paper does not aim at constructing yet another new instrument; instead, it is an attempt to make a contribution to imposing order in this research field, starting from two research questions. Which latent sources underlie the individual differences in choosing different learning goals and strategies? Do separate (independent) processes lie beyond goals and strategies, or their variability can be explained by common factors?

Method

Instruments. The instrument for measuring learning goals and strategies was constructed by taking the indicators of learning goals and strategies from various existing instruments. A questionnaire consisting of 94 items with a

five-point Likert-type scale was compiled, to which respondents provided anonymous answers. Data about gender, age, faculty and year of studies were gathered through the questionnaire. Table 1 provides a list of instruments with the sources and the number of taken items.

Table 1: The list of instruments with sources and the number of taken items

SOURCE	INSTRUMENT	NUMBER OF ITEMS
Entwistle & Tait (1994; in: Waugh & Addison, 1998)	Revised Approaches to Studying Inventory (RASI)	20
Biggs, Kember & Leung (2001)	Revised two-factor Study Process Questionnaire (R-SPQ-2F)	15
Skaalvik (1997; in: Smith, Duda, Allen & Hall; 2002)	Items referring to approach and avoidance	10
Waugh (2002a)	Questionnaire: Academic Achievement Motivation	9
Lavelle, Smith & O’Ryan (2002)	Inventory of Processes in College Composition	6
Waugh (1998, 1999; in: Waugh, 2002b)	Approach to learning scale	5
Elliot & Church (1997; in: Smith, Duda, Allen & Hall; 2002)	Items referring to proving competence and avoiding failure	5
Havelka & Lazarević (1981)	Achievement Motive Scale	4
Seegers, Van Putten & De Bra-bander (2002)	Goal Orientation Questionnaire	4
Vermunt (1998)	Inventory of Learning Styles (ILS)	4
Zimmerman & Martinez-Pons (1986; in: Purdie, Hattie & Douglas, 1996)	Structured interview for assessing student use of self-regulated learning strategies	3
McIlroy, Bunting & Adamson (2000)	Academic self-efficacy	3
Stipek & Gralinski (1996)	Beliefs about intelligence and efforts	3
Midgley <i>et al.</i> (1996, 1997; in: Smith, Duda, Allen & Hall; 2002)	Items referring to proving competence and avoiding failure	2
Roeser, Midgley & Urdan (1996)	Personal achievement goals	1

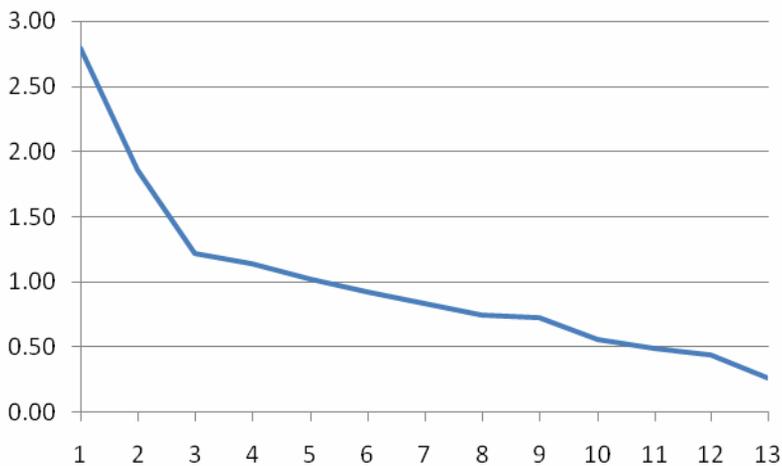
Sample. Research sample consisted of 364 third and fourth year students of different faculties of Belgrade University, out of whom 98 were male and 268 female. Out of the total number of respondents, 138 were students of social sciences, 124 students of humanities and 102 students of natural sciences. The average age of respondents was 22 years and 7 months.

Results and discussion. Factor analysis procedure was applied. Principal components analysis was performed on the set of indicators intended to measure learning goals. Based on Cattell’s criterion for factor extraction („*scree*“ test), 6 factors were kept. Factors were then rotated by promax pro-

cedure. The same procedure was also applied to the indicators of learning strategies. 7 factors were kept.

Bearing in mind Eysenck's suggestions (Eysenck, 1977) that only second-order factors have a theoretical, behavioural and social relevance, second-order factor analysis was applied on the first-order factors obtained in this way. Principal components analysis was performed on the pool of obtained factor scores of 6 factors related to goals and 7 factors related to strategies. Cattell's „*scre*“ test suggested a three-factor solution (Chart 1). The three kept factors, explaining 45.18% of variance of these two sets of variables, were rotated by promax procedure.

Chart 1: Component Eigenvalues



Tables 2, 3 and 4 present the results of factor analysis. Along with the name of each first-order factor, they also contain the items that are highly correlated with it, the original name of subscale (i.e. factor) and the source. As can be seen from Tables 2, 3 and 4, the indicators from different instruments that nominally measure different factors are grouped together. *The first second-order factor* (Table 2) comprises the goals outside learning itself. At one pole, this factor describes the persons who study in order to show their abilities to themselves and the environment. They are not motivated by academic contents, but the fear of negative reactions of others. They try to learn to reproduce the material the best they can, learning by rote, investing a minimal mental effort. They lack the intrinsic learning motivation. This factor comprises the indicators that most commonly define *surface approach to learning* in literature.

Table 2: First second-order factor

First-order factor/item	f	subscale name in the source	source	f1_3	f2_3	F3_3
F6_1 SELF-CONFIRMATION ORIENTATION				.714		-.309
I want to do well in university classes to show my abilities to my family, friends and others.	.706	<i>Performance Approach Goal</i>	Smith <i>et al.</i> , 2002			
An important reason I study is so I won't embarrass myself.	.691	<i>Avoidance orientation</i>	Smith <i>et al.</i> , 2002			
I want to test myself, to see if I am capable of graduating from university.	.678	<i>Self-test-oriented</i>	Vermunt, 1998			
f7_2 SURFACE STRATEGIES (REPRODUCTION)				.607		
I learn some things by rote, going over and over them until I memorise them.	.665	<i>Surface Strategy</i>	Biggs, Kember & Leung, 2001			
I repeat to see whether I can memorise the important parts of the course material for the exam.	.600	<i>Surface Approach to studying: Relying on memorising</i>	Waugh, 2002b			
f3_1 AVOIDING EFFORTS				.546	-.436	
I like it when there is not much to study.	.780	<i>Avoidance orientation</i>	Smith <i>et al.</i> , 2002			
I hope that we will not be assigned a lot of work.	.749	<i>Avoidance orientation</i>	Smith <i>et al.</i> , 2002			
I try to study as little as possible.	.711	<i>Avoidance orientation</i>	Smith <i>et al.</i> , 2002			
f4_1 INTRINSIC INTERESTS				-.351		
I study because I am interested in the topics we learn.	.617	<i>Personally interested</i>	Vermunt, 1998			
Sometimes I wonder why I chose this faculty anyway.	-.595	<i>Lack of Direction</i>	Waugh & Addison, 1998			
I show interest in a large number of topics we study at university.	.501	<i>Desire to learn: Interest</i>	Waugh, 2002a			

Legend²: f – item's loading on the first-order factors fx_1- first-order factors related to learning strategies; fx_2 – first-order factors related to learning goals; fx_3 second-order factors' loadings on the first-order factors

The second second-order factor (Table 3) can be defined as a *deep approach to learning*. This factor is a common source of variability for indicators of first-order factors such as: task/mastery orientation, active cognitive engagement, relating and organising ideas, academic conscientiousness, in-

² Legend is identical for Tables 3 and 4

dependent seeking for information, using free time to deepen the knowledge from related fields.

Table 3: Second second-order factor

First-order factor/item	f	subscale name in the source	Source	f1_3	f2_3	F3_3
f1_1 DEEP GOALS					.758	
I prefer the kind of learning that really makes me think.	.688	<i>Eighth-Grade Personal Task Goals</i>	Roeser, Midgley & Urdan, 1996			
It is important for me to understand the course content as thoroughly as I can.	.655	<i>Mastery Orientation</i>	Smith <i>et al.</i> , 2002			
I study because I want to learn something new.	.628	<i>Task orientation</i>	Smith <i>et al.</i> , 2002			
f1_2 UNDERSTANDING STRATEGIES					.642	
When I am not certain about something, I check it in the book or somewhere else.	.704	<i>Active Cognitive Engagement</i>	Stipek & Gralinski, 1996			
I return to the parts of the course content I did not understand.	.701	<i>Active Cognitive Engagement</i>	Stipek & Gralinski, 1996			
When learning a new lesson, I try to see how the parts are mutually connected.	.660	<i>Deep Approach: Relating and organizing ideas</i>	Waugh & Addison, 1998			
f3_2 ACADEMIC CONSCIENTIOUSNESS				.478	.603	
As I am not certain what is really important, I try to write down as much as possible during classes.	.773	<i>Surface Approach: Unrelatedness</i>	Waugh & Addison, 1998			
I try to attend all lectures and seminars regularly.	.433	<i>Academic Conscientiousness</i>	Mellroy, Bunting & Adamson, 2000			
I start to panic when I am behind in studying.	.426	<i>Surface Approach: Concern about coping</i>	Waugh & Addison, 1998			
f4_2 DEEP STRATEGIES (creating a bigger picture)					-.479	.492
I read additional literature about the topics we study at university.	.849	<i>Seeking information</i>	Purdie, Hattie & Douglas, 1996			
I am interested in new topics, and spend extra time trying to obtain more information about them.	.818	<i>Deep strategy</i>	Biggs, Kember & Leung, 2001			
I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	.802	<i>Deep strategy</i>	Biggs, Kember & Leung, 2001			

In defining the *third second-order factor* (Table 4) the influence of self-regulation in the learning process is dominant. The items referring to setting high goals, investing maximal effort to achieve goals and self-evaluation of achievement have the highest loadings on this factor. Strategies of planning activities and organising time correlate relatively highly with this factor. The items related to goals (competitive orientation, i.e. comparison with others) and achievement strategies (avoiding failure) show somewhat lower loadings on this factor. This factor reminds of the achievement approach/strategic approach to learning (Richardson, 1994a; 1994b; Kember & Leung, 1998; Waugh & Addison, 1998; Sadler-Smith & Tsang, 1998; Fox *et al.*, 2001; Biggs, Kember & Leung, 2001; Waugh 2002b), but the items referring to different aspects of self-regulation are more important for factor definition.

Table 4: *Third second-order factor*

First-order factor/item	f	subscale name in the source	Source	f1_3	f2_3	f3_3
f4_2 DEEP STRATEGIES (creating a bigger picture)					-.479	.492
I read additional literature about the topics we study at university.	.849	<i>Seeking information</i>	Purdie, Hattie & Douglas, 1996			
I am interested in new topics, and spend extra time trying to obtain more information about them.	.818	<i>Deep strategy</i>	Biggs, Kember & Leung, 2001			
I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	.802	<i>Deep strategy</i>	Biggs, Kember & Leung, 2001			
f5_1 SELF-REGULATION						.738
I do my best to achieve the goals I set for myself.	-.704	<i>Striving for Excellence: Standards</i>	Waugh, 2002a			
I evaluate my performance against the goals I set for myself.	-.656	<i>Striving for Excellence: Standards</i>	Waugh, 2002a			
I set myself the highest academic goals which I believe I can achieve.	-.627	<i>Striving for Excellence: Standards</i>	Waugh, 2002a			
f5_2 PLANNING AND ORGANISATION STRATEGIES					.636	
I organise study time carefully, so as to make the best use of it.	-.789	<i>Strategic Approach to studying: Time management</i>	Waugh, 2002b			
I plan in advance and strictly adhere to study plan.	-.780	<i>Reflection</i>	Lavelle <i>et al.</i> , 2002			

I simply sit down to study without much planning and preparation.	.746	<i>Spontaneity – Impulsivity</i>	Lavelle <i>et al.</i> , 2002			
f2_2 LACK OF ORGANISATION STRATEGIES				.447		.536
I always have enough time left to learn everything.	-.747	<i>Surface Approach to studying: Coping</i>	Waugh, 2002b			
I study regularly during the semester rather than leave everything for the last moment.	-.713	<i>Strategic Approach to studying: Time management</i>	Waugh, 2002b			
I finish my assignments on time so I do not need much time for studying.	-.661	<i>Surface Approach to studying: Coping</i>	Waugh, 2002b			
f2_1 ACHIEVEMENT ORIENTATION						-.505
I try to do better than others.	.785	<i>Self-Enhancing Ego Orientation</i>	Smith <i>et al.</i> , 2002			
I feel successful when I know my work is better than others.	.713	<i>Self-Enhancing Ego Orientation</i>	Smith <i>et al.</i> , 2002			
I would love to be a manager at my future job even if that means that I will often be busy and overburdened by obligations.	.502	Achievement motive	adapted according to: Havelka & Lazarević, 1981			
f6_2 ACHIEVEMENT STRATEGIES						-.438
I study until I am sure that I have the most important study details 'at my fingertips'.	.623	<i>Strategic Approach to studying: Effort in studying</i>	Waugh, 2002b			
I try to memorise the most part of course content, since I do not know what will be examined.	.616	<i>Surface Approach to studying: Relatedness</i>	Waugh, 2002b			
I successfully complete every job I start.	.463	Achievement motive	adapted according to: Havelka & Lazarević 1981			

Bearing in mind all three obtained findings, different approaches to learning were described in terms of mutually related components of goals and strategies. The results speak in favour of the findings obtained by Richardson (Richardson, 2007), which indicate that there are causal connections in both directions between motives and attitudes and behaviour in learning.

Table 5: Correlation matrices of second-order factors

	f1_3	f2_3	f3_3
f1_3	1		
f2_3	-.162	1	
f3_3	.132	-.250	1

Correlation matrix of second-order factors points out to their relatively low correlation (Table 5). Correlation between the deep approach to learning and self-regulation is somewhat stronger. Persons with deep orientation more often have control over the learning process³ than the persons applying the surface approach. Relative independence of the first and second factor implies that the same person can sometimes use deep and sometimes surface strategies. This means that environmental factors affect variability.

Grouping of items referring to achievement goals and strategies together with the items referring to self-regulation in the third second-order factor indicates the possibility of a different operationalisation of the construct of achievement approach to learning. In a large number of studies this factor comes close to the deep and/or surface approach to learning in different aspects (Kember & Leung, 1998; Kember *et al.*, 2004). The shortcomings in operationalisation could be one of the reasons of instability of the third factor in previous studies. While deep and surface strategies describe the manner of engagement in the task, achievement strategies refer to the manner of organisation – at what time students will be engaged in task fulfilment and for how long. According to some views, achievement approach does not have to be connected with the specific learning strategy, since the choice of strategy can be made depending on the demands set in instruction – whether understanding is required for achieving success, or learning by rote is adequate (Wong & Lin, 1996). In such a way, achievement approach can be linked with the surface or with deep approach in different environments.

Although a certain number of studies confirmed the presence of two clearly separated approaches to learning – surface and deep – and simply neglected the third approach (Biggs *et al.*, 2001; Kember *et al.*, 2004), bearing in mind the factors obtained here, using a more detailed re-examination of scales for measuring achievement approach which would include more precisely operationalised self-regulation components, different and possibly more precise findings could be obtained.

³ Negative correlation is a consequence of negative loadings on the second-order factor.

Conclusion

This research confirmed the presence of three sources underlying individual differences in the selection of different learning goals and strategies. The obtained three second-order factors correspond to surface, deep and achievement approaches, identified in previous studies (Mirkov, 2009). *The first factor* is determined by indicators of goals pointing out to self-confirmation orientation, surface learning strategies and avoidance of effort. The indicators of academic conscientiousness and lack of intrinsic interests are also linked with this factor. *The second factor* is determined by deep goals, strategies for understanding and indicators of deep strategies (pointing out to striving towards broadening and deepening knowledge) and indicators of academic conscientiousness. *The third factor* is determined by indicators of strategies for planning and organising time for studying, achievement orientation, indicators of achievement-oriented strategies and self-confirmation orientation (testing one's own abilities). However, this factor is largely explained by the indicators of self-regulation in learning, referring to: setting high goals, investing effort in order to accomplish goals and evaluating the accomplished success with respect to the set goals.

Since motives and attitudes are linked with behaviour in learning, and there are some indications that the influences might be two-directional (Richardson, 2007), further attempts at improving the quality of learning must be focused on student motives and attitudes as well, to the same extent as on their behaviour in learning. Knowledge about individual differences would enable individualisation of instruction and its adjustment to different learning motives and strategies of students. The three factors obtained here can contribute to explaining the variability of learning goals and strategies. However, in order to answer the question whether separate (independent) processes underlie goals and strategies, further research is necessary.

In the end, it should be emphasised that the presented results were obtained by exploratory factor analysis, and that they should be checked in the future by applying one of the models of confirmatory factor analysis. In addition to this, it can be objected that there were no conditions for many factors mentioned in literature to manifest themselves since they were represented by a small number of items, which affected their reliability. However, the papers of this type must always strive towards a compromise between length, which negatively affects respondent's motivation, and psychometric characteristics.

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LATENT STRUCTURE OF LEARNING GOALS AND STRATEGIES
Abstract

A review of the relevant literature demonstrates disagreement regarding the number and nature of factors that affect learning goals and strategies, as well as whether the goals and strategies may be treated as separate groups of phenomena. In order to clarify this controversy, a sample of 364 Belgrade University students was given an instrument consisting of 94 indicators taken from a larger number of available instruments that measure approaches to learning, goal orientations and learning strategies. Factor analysis, applied on the obtained data, showed that six first-order factors related to learning goals and seven first-order factors related to learning strategies explain the latent structure of the phenomenon. Then, second-order factor analysis was applied on the pool of obtained factor scores. The assumption that learning goals and strategies share a similar latent structure was confirmed. The results show that a large number of these factors can be predominantly reduced to three latent dimensions: deep approach, surface approach, and achievement approach. The paper suggests that precise operationalisation of the achievement approach is required in the future research.

Key words: learning goals, learning strategies, structure, factor analysis, approaches to learning.

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СКРЫТАЯ СТРУКТУРА ЦЕЛЕЙ И СТРАТЕГИЙ ОБУЧЕНИЯ
Резюме

В литературе присущи сомнения в число и характер факторов, которые могут быть извлечены из инструментов для оценки целей и стратегии обучения, а также, можно ли стратегии и цели рассматривать как отдельные группы явлений. Чтобы это проверить, на образце 364 студента Университета в Белграде применён инструмент, который состоит из 94 индикатора, занятых из большего числа доступных инструментов, которые измеряют подход к учёбе, ориентации на цели и стратегии обучения. По полученным данным проведён исследовательский факторный анализ. Получено шесть факторов первого ряда, которые относятся на цели обучения, и семь факторов первого ряда, которые

относятся на стратегию. На множестве переменных, определённом полученными факторными результатами, проделан факторный анализ второго ряда. Подтверждено предположение, что стратегии разделяют скрытую структуру с целями обучения. Результаты показывают, что огромное число факторов из инструментов, которые измеряют цели и стратегии обучения, в большей степени, можно сократить на три: глубинный подход, поверхностный подход и подход, направленный на достижения. В работе подчёркивается необходимость более точной операционализации подхода, направленного на достижения в дальнейших исследованиях.

Ключевые слова: цели обучения, стратегии обучения, факторная структура, факторный анализ, подходы к обучению.