

Intercurricular Differences in Epistemic Thinking and Individual Thinking Styles of Students in The Higher Education Process

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Abstract:

This article empirically analyzes the interdisciplinary differences between epistemic thinking and students' individual styles of thinking in the process of higher education. The main objective of the study is to identify the level of manifestation of synthetic, idealistic, pragmatic, analytical, and rationalistic thinking styles in 2nd and 4th-year students, and to interpret them as psychological indicators of epistemic thinking development. The study involved 149 students, of whom 67 were in the 2nd year and 82 were in the 4th year. Empirical data were collected using the "Individual Thinking Style" methodology and statistically processed based on the U-Mann-Whitney criterion. The results showed that for all studied thinking styles, the indicators of 4th-year students are higher compared to 2nd-year students. In particular, statistically significant differences were identified in synthetic, idealistic, pragmatic, analytical, and rationalistic styles of thinking. The results obtained indicate that in the process of higher education, students' epistemic thinking is gradually developed through the analysis and generalization of knowledge, relying on evidence, and making rational decisions in practical situations.

Keywords: epistemic thinking, styles of thinking, higher education, student, synthetic thinking, analytical thinking, pragmatic thinking, rationalistic thinking, U-Mann-Whitney criterion.

Introduction

In the modern higher education system, alongside forming students' professional knowledge and skills, one of the important psychological and pedagogical tasks is developing their independent thinking, ability to critically evaluate information, draw conclusions based on scientific evidence, and

apply a problem-oriented approach in various situations [1]. In today's educational process, the student must be formed not as a subject passively accepting ready-made knowledge, but as an active individual capable of seeking, analyzing, processing knowledge, and applying it in practical conditions. From this perspective, the study of students' epistemic thinking is of current scientific and practical importance for higher education psychology [2].

Epistemic thinking is a complex cognitive-psychological process related to an individual's attitude toward knowledge, the evaluation of knowledge sources, the determination of information reliability, the comparison of arguments, and the formulation of logically sound conclusions. This type of thinking occupies an important place in shaping the student's scientific worldview, professional competence, critical thinking, and ability to make independent decisions. Especially in the process of higher education, students' ability to link theoretical knowledge with practical experience, evaluate a problem from different perspectives, and express a reasoned opinion manifests as one of the important signs of developing epistemic thinking. When studying the epistemic thinking of students, individual styles of thinking can be considered as important psychological indicators. Thus, a synthetic style of thinking facilitates the generalization of various information and the formulation of holistic conclusions, while an analytical [3].

At different stages of higher education, students' thinking styles manifest differently. In the initial stages of learning, students are more oriented toward adaptation to the educational process, mastering theoretical knowledge, and mastering core concepts. In senior years, their thinking activities begin to take on a more independent, analytical, practical, and professionally oriented character. Especially for high school students, the possibilities for analyzing, summarizing, and applying knowledge in practical situations are expanded through scientific inquiry, course work, final qualification work, and pedagogical or professional practice. Existing empirical data also show that there are certain differences between 2nd and 4th-year students in their thinking styles. The study involved 149 respondents: 67 second-year students and 82 fourth-year students. According to the results obtained based on the Mann-Whitney U-criterion, the average ranks of 4th-year students in synthetic [4].

Methodology

This study aimed to empirically identify intercurricular differences in the manifestation of epistemic thinking and individual styles of thinking among students in the higher education process. The study was organized based on a comparative-empirical design. In it, the thinking styles of 2nd and 4th-year students were compared as indicators of independent groups. Therefore, in the article, the concept of "dynamics" was interpreted not in the sense of long-term observation of the same group of students over time, but in the sense of identifying psychological differences between learning stages. 149 students participated in the study [5]. Of these, 67 were second-year students and 82 were fourth-year students. The selection of a sample specifically for 2nd and 4th-year students allowed for the determination of how thinking styles manifest depending on the learning stage within the higher education process. In the available empirical data, a comparative analysis was conducted between the specified age groups. The "Individual Thinking Style" methodology was used to collect empirical data [6]. This methodology serves to determine the individual characteristics of students' thinking. Within the framework of the study, the following methodological scales were analyzed: synthetic thinking style, idealistic thinking style, pragmatic thinking style, analytical thinking style, and rationalistic thinking style. The aforementioned scales were interpreted not as a direct measure of epistemic thinking, but as psychological indicators reflecting its development [7]. The synthetic style of thinking expresses the student's ability to generalize various data, identify the relationships between them, and approach the problem as a whole. The idealistic style of thinking is associated with understanding the problem within a broader conceptual context, theoretical generalization, and the advancement of new approaches. A pragmatic style of thinking reflects the ability to find effective solutions in real situations and to use available opportunities rationally [8]. The research process was carried out in several stages. First, the respondents were explained the purpose of the methodology, the procedure

for its execution, and the answer rules. In the next stage, students performed the assignments of the methodology individually. The received responses were processed based on the criteria of the methodology, after which results were formed for each respondent according to the corresponding scales [9]. Subsequently, the indicators of 2nd and 4th-year students were included in the statistical analysis as separate groups. Mann-Whitney's U-test was used for the statistical processing of empirical data. This criterion was applied to identify differences between the two independent groups. In the study, for each thinking style, the average ranks of 2nd and 4th-year students, the value of U, and the level of statistical significance were determined. When interpreting the results, the $p \leq 0.05$ level was taken as a statistically significant difference, and the $p \leq 0.01$ level was taken as a difference of high statistical significance. This methodological approach allowed proana [10].

Results and Discussion

Results. The research results showed that there are statistically significant intercurricular differences in the manifestation of individual thinking styles in 2nd and 4th-year students. Empirical data were analyzed based on the "Thinking Styles" questionnaire by R. Bramson and A. Harrison. The study involved 149 students, of whom 67 were in the 2nd year and 82 were in the 4th year. The differences between the groups were determined using the Mann-Whitney U-test [11].

Table 1
Results of the methodology for individual thinking style in 2nd and 4th-year students of higher education institutions based on the Mann-Whitney criterion, n=149

Scales	Course	N	Medium rank	U	p
Synthetic style of thinking	2-y course	67	62,12	1884	0,001**
	4-y course	82	85,52		
Idealistic style of thinking	2-y course	67	62,15	1886	0,001**
	4-y course	82	85,50		
Pragmatic style of thinking	2-й курс	67	65,66	2121	0,017*
	4-й курс	82	82,63		
Analytical style of thinking	2-й курс	67	64,63	2052	0,008**
	4-й курс	82	83,48		
Rationalist style of thinking	2-й курс	67	66,70	2191	0,034*
	4-й курс	82	81,78		

Note: * $p \leq 0,05$; ** $p \leq 0,01$.

According to the table data, the average rank indicators of 4th-year students across all studied thinking styles were higher than those of 2nd-year students. This indicates that higher-year students are more active in aspects of thinking related to generalization, analysis, relying on evidence, finding a practical solution, and making a rational decision. In terms of synthetic thinking style, the average rank of 2nd-year students was 62.12, while that of 4th-year students was 85.52. This difference proved to be statistically significant: $U=1884$; $p=0.001$. This result indicates that 4th-year students are more capable of summarizing various data, identifying connections between knowledge, and approaching the problem as a whole. Regarding the idealistic style of thinking, higher indicators were also recorded in 4th-year students [12]. The average rank of 2nd-year students was 62.15, while that of 4th-year students was 85.50. The difference is statistically significant: $U=1886$; $p=0.001$. This is a witness.

Regarding the realistic/rationalist style of thinking, the average rank for 2nd-year students was 66.70, while for 4th-year students, it was 81.78. This difference was also statistically significant: $U=2191$; $p=0.034$. This result indicates that senior students are relatively more prone to objectively assessing the situation, relying on evidence and experience, thinking logically, and making rational decisions. Overall, the results confirmed that individual thinking styles in 4th-year students manifest at a higher level compared to 2nd-year students. Particularly significant differences identified in synthetic and idealistic styles of thinking indicate that high-level students are more actively developing the ability to generalize knowledge, conceptualize, and approach the problem holistically. The differences identified in analytical, pragmatic, and realistic/rationalist thinking styles substantiate that as the [13].

Analysis of results and discussion. The research results showed that students' individual styles of thinking in the higher education process differ significantly across courses. When comparing the indicators of 2nd and 4th-year students based on the Mann-Whitney U-criterion, it was established that across all studied scales, the average ranks of 4th-year students are higher. This indicates that in the higher stages of higher education, students' thinking activities acquire a more systematic, analytical, practical, and evidence-based character. The identification of higher indicators in the synthetic style of thinking among 4th-year students indicates the development of their ability to combine various types of information, see internal connections between knowledge, and approach the problem holistically. The lower indicator in 2nd-year students can be explained by the fact that they are even more at the stage of mastering theoretical knowledge, adapting to the educational process, and mastering the basic [14].

The identified difference in the pragmatic style of thinking also carries important psychological content. The higher level of pragmatic thinking in 4th-year students indicates the development of skills in assessing the real situation, effectively utilizing available opportunities, choosing a useful solution, and making decisions oriented toward practical results. In the upper stages of higher education, students more frequently encounter real problems during practice, independent study, scientific research, and preparation for professional activities. This elevates their thinking from a theoretical understanding to a level of practical application.

High indicators of analytical thinking style in 4th-year students indicate a relatively more developed ability to analyze evidence, identify cause-and-effect relationships, compare data, and formulate reasoned conclusions. One of the primary characteristics of epistemic thinking is precisely reasoning. The results obtained based on the Mann-Whitney U-test show that the identified differences are statistically significant. Specifically, synthetic and idealistic thinking styles revealed significant differences at a level of $p=0.001$. This indicates a more pronounced formation of generalization, conceptual understanding, and a holistic approach to the problem among 4th-year students. The result for analytical thinking, $p=0.008$, indicates the development of a scientific-analytical approach in senior students. Indicators for pragmatic thinking $p=0.017$ and for realistic/rationalist thinking $p=0.034$ confirm that 4th-year students also have significantly developed practical and logical decision-making capabilities.

Analysis shows that the differences between the thinking styles of 2nd and 4th-year students are not accidental, but can be considered a psychological pattern related to cognitive, professional, and personal development. At the same time, it is advisable to interpret the studied styles of thinking not as direct structural components of epistemic thinking, but as psychological indicators reflecting its development. Synthetic, idealistic, pragmatic, analytical, and realistic/rationalist thinking styles express the student's way of working with knowledge, their attitude toward evidence, their approach to the problem, and the nature of their conclusions. This allows for an indirect assessment of the process of formation and development of epistemic thinking.

The results obtained demonstrate the necessity of purposeful development of epistemic thinking in the process of higher education. To achieve this, it is advisable to systematically utilize problem-based learning, scientific discussions, case studies, reflexive tasks, independent research elements, evidence-based analysis, and methods for solving practical situations within the educational process. It is especially important to develop epistemic thinking in 2nd-year students from an early stage [15].

Conclusion and Recommendations

The results of the empirical study showed that students' individual thinking styles in the process of higher education differ significantly across courses. When comparing the results of 2nd and 4th-year students based on the Mann-Whitney U-test, statistically significant differences were identified in synthetic, idealistic, pragmatic, analytical, and realistic/rationalist thinking styles. The higher average rank indicators of 4th-year students across all scales indicate that analytical, conceptual, practical, and evidence-based aspects of thinking are more actively formed in senior years. According to the research results, the more pronounced manifestation of a synthetic style of thinking in 4th-year students indicates the development of their ability to generalize various information, realize the interconnections between knowledge, and approach the problem holistically. Advantage in idealistic thinking style.

Results on pragmatic and realistic/rationalist thinking styles show that 4th-year students are relatively more capable of assessing the real situation, effectively using available opportunities, choosing a useful solution, relying on evidence and experience, and making rational decisions. This means that in the higher stages of higher education, students' thinking activities rise not only to the level of mastering theoretical knowledge but also to the level of applying it in practical and professional situations.

Overall, the results obtained allow for the interpretation of synthetic, idealistic, pragmatic, analytical, and realistic/rationalist thinking styles as important psychological indicators reflecting the development of students' epistemic thinking. In this regard, epistemic thinking manifests in students through the processes of critical assessment of knowledge, reliance on evidence, systematic approach to the problem, independent formulation of conclusions, and practical decision-making.

Thus, to develop students' epistemic thinking in the higher education process, it is advisable to systematically utilize problem-based learning, scientific discussions, case studies, reflexive tasks, independent research activities, and evidence-based analysis methods. Especially, the formation of epistemic thinking in 2nd-year students from an early stage will contribute to the strengthening of their independent, analytical, and professionally oriented thinking potential in subsequent stages of study.

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